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San Francisco, Calif.

August 1, 1926
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Journal of Electricity

Devoted to the Economic Production and Commercial Application of Electricity
IN THE ELEVEN WESTERN STATES

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Here's the New Non-Metallic Sheathed Cable

DURAX

REG. U.S. PAT. OFF.

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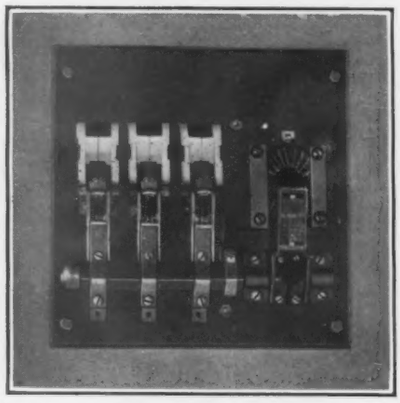
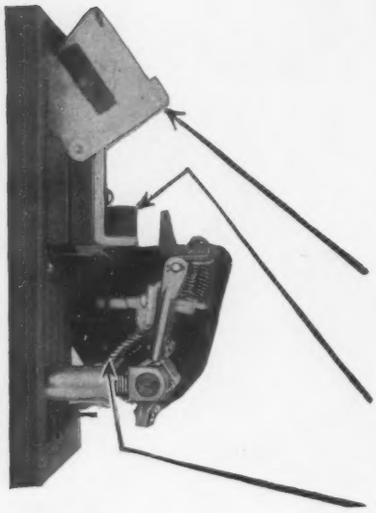
Across the Line A. C. Starter—Bulletin 6000

Rugged and Dependable—Note Features



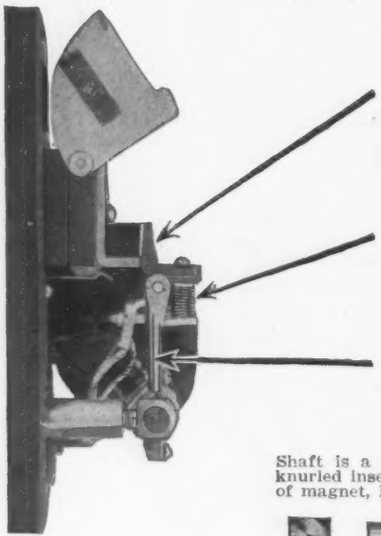
Since the very beginning Sundh has been the pioneer and leader in A.C. magnets and in Controllers of Multiple Contacts. This new A.C. starter is no exception.



The arc shields being pivoted can be swung up out of the way for inspection or replacement of stationary contacts.

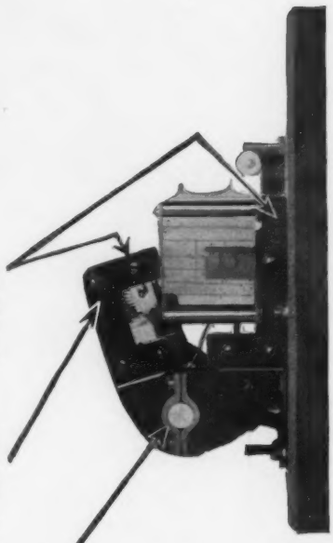
Stationary contact is composed of a carbon block and a copper angle bolted together and ground to accurate finish and mounted on pure Bakelite extension blocks.

Two braided copper leads—under each lever out of the way.



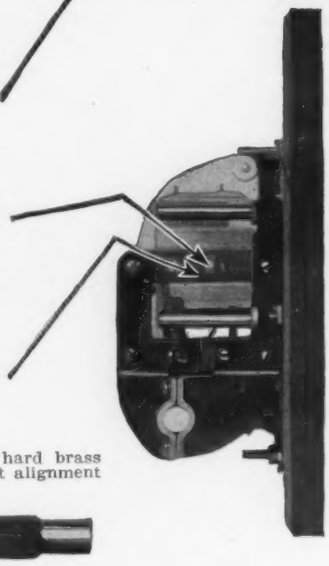
Movable copper contact—affords wiping action against carbon and final rolling contact on the copper. This contact is solid pure copper ½ in. in width, 1⅛ in. in length and 1¼ in. thick, conservatively rated for 50 amp. continuous. This contact is produced by a strong helical spring acting at all times. This spring is also insulated from all heat produced by the contact.

Lever is made of two heavy brass punchings bolted together over insulated square shaft.



Main magnet frame and movable armature are composed of thin, accurately punched laminations and securely bolted to heavy punched iron frames.

Movable armature is located and clamped to square insulated shaft which pivots in rugged ½ in. diameter by ⅝ in. long bearings. This bearing is a brass shaft, pivoting in an iron bearing. It cannot rust together and on account of size its wear is practically nil. Bearing caps, being removable, permit the taking out of the shaft with armature and contact levers assembled, facilitating ready inspection of the pole pieces and making it convenient to change magnet coil.



The magnet is so designed that the poles meet half way in the coil, which affords maximum pulling power, throughout entire range from full open to full closed position.

The faces of pole pieces are accurately ground with secondary coil inserted eliminating all noise.

Shaft is a pure Bakelite moulding with a rugged ½ in. diameter hard brass knurled insert; ⅝ in. shaft is of the square type which affords perfect alignment of magnet, levers and movable contacts.

SUNDH ELECTRIC COMPANY, NEWARK, N. J., U. S. A.

THE DEMMERT CO.

106 West 3rd St., Los Angeles
74 New Montgomery St., San Francisco

Gentlemen: Please send me Sundh's booklet on A. C. Starters.

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Address ..... Company .....

Position .....

SUNDH
Trade Mark

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IN THE ELEVEN WESTERN STATES

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What's a Hundred Years?

THE first hundred years are the hardest, even for editors. Witness the following letter commenting upon a mistake that happens in the best of editorial families:

To the Editor:

Sir: Please refer to page 23 of your issue of July 15, 1926, to the article headed "Subscription Paid to Year 2226."

In the last paragraph of the letter that you quote from the New York Steel Exchange, Inc., it says "your advertisements would pay our subscription well into the twenty-second century." That is surely a compliment, but why not be satisfied with it instead of jumping it ahead one hundred years.

Question: Is not the year 2226 in the twenty-third century?

F. F. SPRINGER.

San Francisco, Calif.
July 26, 1926

It is no more than fair to state that the mathematical lapse to which Mr. Springer refers is attributable to the editors and not to Mr. Lamb, who is a distinguished engineer and obviously a mathematician incapable of error so flagrant. Possibly the probability of a complete change in the editorial staff at some time prior to the date Mr. Lamb names accounts for the lack of interest on the part of the editorial staff in establishing the date of the expiration of Mr. Lamb's subscription.

EXPENDED FOR GROWING UTILITIES

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Pioneers for 37 Years

PUBLIC UTILITIES are successfully meeting a huge and fast-growing demand for electric light, power and transportation. Practically as old as the industry itself, the Stone & Webster organization has kept even pace with the extraordinary expansion of the utilities for thirty-seven years.

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Stone & Webster has examined and appraised properties to the total value of five and one-half billion dollars, including many of the country's foremost public utilities.

Its construction of power stations aggregates 2,750,000 horse power. The systems fed wholly or in part by these stations serve a population of 15,000,000—twice the population of New England. This includes 7,000,000 served by systems receiving power from Stone & Webster-built hydro-electric plants.

Power construction work in progress is a half million horse power. Three-quarters is for old customers who have learned that Stone & Webster-built stations pay dividends. This is because of the economy for which they are famous, and also because Stone & Webster knowledge based on actual experience of operating sixty widely-distributed utilities is available for extending old systems or planning new ones.

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The Securities Division of Stone & Webster rounds out and completes the organization's intimate contact with the public utilities industry. Through its operations in financing properties and handling their securities it provides thousands of individuals and institutions with favorable opportunities to invest their funds in electric light, power and transportation—fundamental necessities of modern life.

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PHILADELPHIA: Real Estate Trust Bldg.

EDITORIAL

Will Steam Supplant Hydro in California?

THAT the present ratio of one-third steam and two-thirds hydro which holds for the installed capacity of California will be radically changed or possibly reversed is the opinion advanced by certain engineers who have been studying closely the power situation in the state. Deficient water supply, increasing cost of hydro developments, the reaching of the possible maximum efficiency in hydraulic machine design, and most important, the increasing efficiency of steam-power generating equipment are among the reasons to which this change is ascribed.

The situation was commented upon by H. A. Barre, executive engineer, Southern California Edison Company, in a paper before the recent meeting of the A.S.M.E. which was published in the last issue of the Journal of Electricity. Mr. Barre pointed to the Long Beach and Seal Beach steam plants where efficiencies of 425 to 450 kw-hr. per bbl. of oil have been obtained. With present fuel costs, he stated that further development of stream-flow hydro plants is practically out of the question and that even projected storage hydro plants must be scrutinized carefully as to cost. Only a change of several hundred per cent in the cost of fuel can change this situation, in his opinion. His statements are borne out, moreover, by the recent announcement of his company of a projected steam plant with an ultimate capacity of 600,000 hp. which will be used as a base plant rather than for standby as has been the practice in the past with California companies operating largely with hydro.

Obviously Mr. Barre's statements will be considered radical by many engineers in a section of the country where for years white coal has been king. Careful thought, however, indicates otherwise. As has been said before, the majority of the hydro power sites economically feasible have been or are being developed. Efficiencies of 85 to 90 per cent of the theoretical have been obtained in water wheels, and there is little opportunity for improvement here. A cycle of comparatively dry years has placed added emphasis on steam plants. Foremost of all, there has been an increase in the efficiency of steam generating equipment ranging between three and four hundred per cent during the past decade. Is it not reasonable to believe that even greater efficiencies will be achieved during the next decade?

Many of the Western states abound in low-grade coal which can be utilized either in pulverized form, as has been done successfully in Washington and Colorado, or can be subjected to low temperature distillation and burned in the form of coke and gas. Even California has extensive fields of lignite, and transportation facilities are such that cheap coal can be brought from Utah, Arizona, New Mexico or Washington.

In the face of these facts it is reasonable to look for an increase in steam-plant construction in the near future. Whether steam will supplant hydro in supremacy is a debatable subject, but certainly conditions point to a decided swing of the pendulum toward steam.

Architects and Builders Should Be Urged to Adopt Red Seal Minimum Standards

WITH 272 Red Seal homes reported by the various subdivisions of the California Electrical Bureau covering the period between Feb. 1 last and July 1, that organization is doing a fair job, as compared to other sections of the United States, but it is no more than fair. As a matter of fact, the results are disappointing to the Advisory Committee of the Bureau, which confidently expected more than double the homes that have been reported thus far.

At the last meeting of the committee that was held at Los Angeles just prior to the Pacific Coast Electrical Association convention much discussion took place as to ways and means of bringing about better results than had been obtained thus far. The consensus of opinion as finally expressed was that (1) a public demand for the higher standards of adequacy as provided by the Red Seal plan must be created; (2) this could be brought about only through the medium of consumer-advertising on a state-wide basis; (3) since the funds available were inadequate for this task, means would have to be provided through the allocation of newspaper and other space now being used by the power companies, space in the power-company house organs, and by direct-mail efforts on the part of the Bureau itself; (4) when definite assurance was received as to what could be accomplished by (3), an advertising manual should be prepared showing the type, style, and quantity of advertising coverage for circulation among builders and architects in order that they might be persuaded to (5) agree to adopt the Red Seal minimum standards of adequacy, specifying them in all their house-wiring jobs, in order to tie in with the public demand that would be created by (3); and (6) the entire force available in the Bureau organization should bend every effort to follow up the work by personal solicitation among builders and architects in order to bring about a

proper fulfillment of its duty to those who are supporting it financially.

The Bureau advertising committee, headed by A. H. Nicoll, is preparing the work called for under (3). In the meantime there is no reason why the personal solicitation described under (6) should not be undertaken at once. The specification of Red Seal standards by the architect and builder is the solution of the problem, and now is the time to go actively to work to bring this about.

Bitterness Should Have No Place in Industry's Arguments

NEED a man be called a "demagogue," a "politician" or a "radical," to use some of the terms popularly applied, simply because he attacks the electrical industry? In a recent public pronouncement, Franklin T. Griffith, former president of the N.E.L.A., urges that the industry give credit to the authors of such attacks for at least a measure of sincerity. In discussing one such, Mr. Griffith said:

"It is a mistake that we should, when we find people expressing opinions of that sort, immediately conclude that there is some ulterior motive for the pronouncement. It is a mistake to believe that there is a lack of sincerity on the part of the proponent, and I say that if we have a lack of belief in their sincerity it inevitably will bring about a feeling on their part of a lack of sincerity on ours. . . . . We do not get anywhere by cursing the man who does not have the same opinion as ourselves. We must by force of our argument and the strength of our cause convince him that we are right."

Condemnation and bitterness have no place in combating the arguments of those who do not agree that the present scheme for the development and distribution of electric energy is the wisest, best and most sane. By employing methods that fall in the class of mud-slinging the industry is doing itself more harm than good. Even the soundest and best arguments will fail to win a point if they are backed up by a heavy club.

Storing Water Is Storing Kilowatt-Hours

AS the farmer who grows hay ofttimes buys hay to supply his stock until such time as his growing hay is ready for harvest and perhaps sale, so interconnection of power lines and the exchange of power from one company to another is advantageous to all concerned—this is the interesting comparison made by the San Joaquin Light & Power Corporation in one of its recent advertisements. This thought opens up possibilities for power exchange which have been little considered in the past.

When indications point to a dry year, such power companies as rely largely upon hydro for power might do well to start buying power early in the season from some more fortunately situated neighbor power company. In this way the draft upon their own water facilities could be lightened, and when late summer arrived there still would be a supply of water, stored over the spring months, to help tide over the demand. The neighbor power system itself would not have to strain to carry both loads, but could assist the short company to carry its load more normally.

Water thus held in storage amounts to the storage of kilowatt-hours of electricity. As a rule, for the farming interests which often utilize the water after it has done its work of furnishing power, this lengthening out of the water supply to extend into late summer might prove a blessing indeed.

While this idea is nothing particularly new, it treats of a phase of the subject which the industry generally has not taken into account in the past. The opportunities for economy in such a far-sighted provision for demand, the insurance of service to customers, and the smoothing out of load curve for both the short power company and the neighboring assisting company have not been given full consideration. There has been much last-minute buying of power to cover shortage due to drought, but in this suggestion lies an opportunity to conserve home resources for the peak demand, meanwhile getting additional supply from a more fortunately situated neighbor, and placing neither in strained circumstances at any time.

Unethical Refrigeration Advertising Condemned

WHEN a device such as the electric refrigertor has leapt into public favor with such tremendous impetus, it is but natural that the swath cut through a more or less quiescent atmosphere should set up eddies of a disturbing character. Instead of blindly moiling about in those eddies, however, striking any head that might come their way, the refrigeration interests, including the ice men and the electric refrigeration men, have had the calmness of judgment and sheer good sense to recognize that such practices would but entangle all in needless turmoil. This is to the credit of all concerned.

A recent conference between the men representing the ice industries, manufacturers of electric refrigerators, and representatives of the electrical industry resulted in a resolution condemning unethical advertising and sales methods and urging that refrigeration be sold and not at the expense of any particular means of arriving at it. It is said that the conference was conducted frankly, that examples of unfair or detrimental advertising were cited against both sides, and that out of this housecleaning there came the determination that no one would gain and that all would lose, if such practices were continued.

There is room for both the ice company and the electric refrigerator, and the natural economic balance between the two will find itself adjusted just as similar economic adjustments have had to be made in the past. The increased attention given refrigeration is certain to bring greater demand for refrigeration of both kinds. How much better that

the two fields of activity should co-operate to achieve this end than that one should resist the other and, so resisting, impede the general movement toward better refrigeration by just that much.

Similarly, manufacturers of electric refrigerators have come to a common understanding that sales practices between them shall be upon clean ground. In the flush of anxiety to get into activity there is danger that individual salesmen or individual sales organizations may lose sight of these simple ethics. The refrigeration industry has set a standard; let its individual members hold to that standard.

Do Not Overlook New Blood in Association Activities

STAGNATION is the bane of all human endeavor. It is the inevitable result of a lack of new life, new blood, new vision or new ideas; and it occurs in organizations just as surely as it occurs in other instances.

Notable examples of the serious consequences of "ingrowing," in several Sections of the Pacific Coast Electrical Association and of the Northwest Electric Light & Power Association, are evident even to the casual observer. Stagnation is foredoomed when committee and Section chairmanships are rotated within restricted circles. This is in no wise a reflection upon the very able men who unwittingly may comprise such circles, but is a condemning feature of faulty system. Such a policy overtaxes the energy and the initiative of the few and spurns the ability and interest of others who are fully qualified to lead in and contribute to the development of the industry. From still a different angle, the most vitally important responsibility of present leaders in the industry is the development of the leaders of the future.

It is timely to offer these few words of warning to those upon whom rests the responsibility of selecting the Section and committee chairmen of both the P.C.E.A. and the N.W.E.L.&P.A. for the coming year's service. Only with the introduction of new blood and younger men will the industry benefit to the fullest extent from the work of these important organizations.

Remarkable Range Sales Record of Puget Sound Power & Light Company

ARGUMENTS of those more pessimistic central-station executives that electric ranges are difficult to sell are blasted by the record achievement of the Puget Sound Power & Light Company as set forth on another page of this issue. During a sixty-day campaign this company sold 2,043 electric ranges in its district. The campaign is all the more remarkable when it is understood that the company already was serving more than 12,000 range consumers and that there were only 64,000 residential-consumer prospects to solicit. Carefully laid plans, intensive preparatory work and the closest co-operation between all factors during the conduct of the campaign were elements in its success. The industry can take a lesson from this company, particularly in learning what can be accomplished through co-operative planning and execution—co-operation between the manufacturer and the utility company and co-operation between the sales department and other departments within the company.

Beauty That Kills and the Electric Store

NATURALLY enough, the ideal of every electrical merchandiser is to arrange his store in the most pleasing and attractive manner possible. The arts of display are exercised to the utmost of the individual merchandiser's capacity to this very end. But once in a while a merchandiser succeeds so well that his store's very attractiveness defeats its own purpose, the mundane purpose of selling merchandise.

Every once in a while some particularly beautiful store is put on display. Elegance breathes from its every pore, and the photographs of it are like unto the rotogravure effulgence that the homes of the rich present to the naked eye of a Sunday morning. Its every appointment is designed with the utmost of taste and distinction, and in toto, it is the ultra of ultras.

But sometimes, ere the photographs can be published in the magazines, pointing with pride to this latest palace of electrical establishments, the place has closed its doors for lack of business. It was beautiful, but it was too beautiful. The common, ordinary mortal, he who buys merchandise, was afraid to walk across its threshold. It was too lovely. It made him self-conscious of the fact that his tie was creased or his shoes dusty.

There is danger in too much elegance, especially if one uses it as an appeal with intent to sell. If an electrical merchandising establishment by its beauty of appointments and expensiveness of aspect gives the impression that its merchandise belongs to the classification of luxury, it hurts rather than helps its sales. The buyer at once associates the merchandise displayed in too elegant a fashion with some of the accompanying rich rugs, furniture or drapes which he cannot afford, and with a sigh resigns himself to the fancy that such things are not for a mere mortal such as he.

Because electrical merchandise is anything but luxury merchandise, this impression should be guarded against. Electricity provides convenience and saves labor and time. Electrical appliances are modern machinery applied to domestic uses. Some appliances are very prettily patterned and adorned, it is true, but their uses are certainly not luxurious. They are useful first, and beautiful as a matter of course. The display of such appliances should be conducted upon the same plan.

There is the other extreme, too, the extreme of too little care in display, too little attention to cheerful and pleasant surroundings in the merchandising store. Yet because lack of beauty or elegance is bad, too much vulgar display of wealth is not the cure for the evil. There is a nicety which must be observed in these matters, calculated upon the logical appeal to be made to those who buy merchandise, people in all walks of life.

EXTERIOR view of the recently completed Shrine Civic Auditorium, Los Angeles. The auditorium is seen in this picture, the pavilion building not being visible. The electrical equipment for this building presents some remarkable advances in the art.

Electrical Equipment of the World's Largest Stage

New Al Malaikah Temple Civic Auditorium in Los Angeles Embodies Unique Electrical Features

By C. A. Sanborn

Holmes and Sanborn, Consulting Engineers

FIFTEEN feet wider than the New York Hippodrome, the stage of the new Al Malaikah Temple Civic Auditorium is unquestionably the largest indoor stage in the world. The switchboard is the largest stage switchboard ever constructed, and the main chandelier in the auditorium is claimed by fixture men to be the largest lighting fixture ever built. In the construction of this mammoth auditorium the electrical problems presented to Holmes and Sanborn were no less mammoth. How they were handled is modestly set forth in the accompanying article.

RANKING with the great auditoriums of the world and containing one of the largest indoor stages, the Shrine Civic Auditorium recently has been completed by Al Malaikah Temple in Los Angeles. Joined to the auditorium building is a three-story pavilion building arranged to handle carnivals, fairs and exhibits, banquets and large dances, making, together with the auditorium, a group of two buildings sufficient to serve the civic needs of Los Angeles as a convention city.

The Moorish style of architecture with its distinctive features, as designed by John C. Austin, F.A.I.A., dominates the group. The buildings cover an L-shaped area measuring 294 ft. on Jefferson Street, 279 ft. on Royal Street and 564 ft. in length on the east property line and so arranged that the banquet floor of the pavilion building leads directly into the north side of the auditorium stage, making it possible to arrange pageants and processions in the banquet hall before proceeding onto the stage. Housed also in the group are the Shrine organization rooms.

Auditorium Lighting

The auditorium, with seating accommodations for 6,442 people, has an immense stage measuring 192 x 72 ft. and having a proscenium opening of 100 ft., which is 15 ft. wider than that of the New York Hippodrome. The decorative color designs in the auditorium range from rich deep blue, reds and deep scarlet and royal purples to bright blues and soft shadings of buff and yellow, making an extremely artistic effect. The ceiling is in effect a tinted canopy with the blue sky and stars above. A double cove illuminating the sky and the canopy, with its draped folds held by huge ropes, is lighted by the main chandelier.

Reported to be the largest electric chandelier ever built, this fixture weighs approximately 5 tons and has a diameter of 20 ft. and an overall length of 28 ft. The lighting is in four colors, the total load in the fixture being 65 kw. Relamping is accomplished through a trap door in the canopy ceiling above the fixture through which a ladder may be lowered.

In addition to the ceiling coves and main fixture, decorative coves in three colors are installed around the front and side walls, about 18 ft. below the main ceiling. A secondary ceiling above the orchestra pit is cove lighted in three colors, no white light being used. At the center of this ceiling is a smaller crystal fixture also in three colors.

The soffit of the balcony is panelled to provide for ventilating grilles. In each of the seventeen panels is a fixture in four colors. The ceiling space outside the panels is provided with fixtures in white light only, to give uniform illumination during conventions.

Emergency lighting in the auditorium is provided by aisle lights which are located at every fourth row on the main floor and at every third row in the balcony.

Stage Lighting

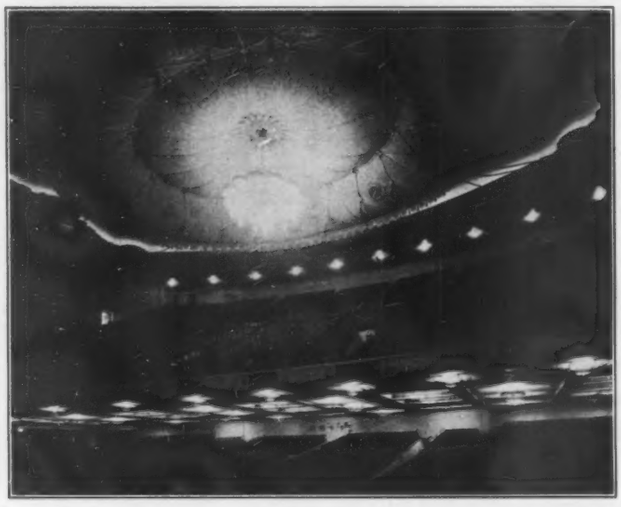
All of the stage lighting is in four colors. A single row footlight with 150-watt lamps wired in a sequence of red, white, amber, white, blue, white, red, etc., provides down-stage illumination. This is augmented by six banks of four 500-watt floods set in front of the balcony and 96 500-watt spot floods overhead for orchestra pit and front stage lighting. In addition to the above the stage has:

7 99-ft. borders using 500-watt lamps.
68 30-amp. incandescent pockets.
8 30-amp. proscenium strip pockets.
15 75-amp. d.c. pockets.

The first border is of the "concert type," and is equipped with four-unit suspension hoods, each unit being provided with separate leads, terminating in a screw plug for attachment to raceway outlets. There are also in the concert border 12 pin plug connectors on 12 circuits for the additional attachment of spotlights.

Due to the extreme width of the stage the ordinary type of prescenium strip lights was not desirable. Therefore a four-section pocket was provided on each side of the proscenium opening, into which portable strip lights can be plugged. The two pockets of the same color on both sides are connected to the same dimmers. Four 1,000 to 2,000-watt dimmers per color are supplied and arranged with paralleling switches to dim any wattage from 1,000 to 8,000 watts per color.

Due also to the great width of the proscenium opening, the electrical equipment was engineered



It will be seen from this view of the auditorium that no columns are used to support the balcony. The largest bridge truss known to have been used inside a building supports the balcony. The immense ceiling fixture, 20 ft. in diameter, floods the auditorium and particularly the balcony.

so as to allow a segregation of the center 50 ft. of the stage in order to provide for the ordinary show and visiting theatrical companies, which in general cannot utilize a 100-ft. opening.

The circuits and dimmers for the footlights and borders, therefore, are arranged so that either the "full proscenium" or the "short proscenium" can be used, using the same switch and dimmer handles on the switchboard for the control of lights for either opening. Each border is divided into three sections, the center one being 49 ft. long and the two end sections each 25 ft. long. Each section is hung independently of the others, allowing the raising of the two end sections when the "short proscenium" is used so as not to interfere with the sets.

As the building is located outside the downtown section, no direct current is available. A 100-kw., 3-wire, 110/220-volt direct-current generator set consisting of two 50-kw. 110-volt generators in series driven by a 150-hp., 2,200-volt, 3-phase, 60-cycle induction motor was provided, located in the auditorium service switchboard room. This generator set provides direct current for all the d.c. arc pockets and also provides an extra feed to the projection room supplementing the generator set for projection service.

In addition to the above equipment, a 400-amp., 3-wire auxiliary lead is brought up to both sides at the rear of the stage from which additional capacity can be obtained for any effects which need not be controlled from the stage switchboard.

On the stage adjacent to the pilot switchboard is located the stage manager's station on which is mounted a return call annuciator to all the dressing rooms, curtain control equipment and signals for intercommunication telephones, one on the house system and one on the private line to the projection booth; also a return call buzzer to the projection booth and a stage ventilator control station. A desk shelf is provided for script and notes.

The stage ventilator control operates from the emergency light service and operates to close stage dampers when the circuit is broken. Operating keys are located in the box offices and the stage manager's station.

Stage Switchboard

A Hub Electric Company pre-set, selective, remote-control stage switchboard controls all the stage and house lights. This switchboard is 26 ft. long and has 152 Locke main pilot switches and 279 Ward-Leonard dimmer plates and 147 Sundh contactors. It is the largest stage switchboard ever constructed.

Projection Room

The projection room is located at the rear of the main floor of the auditorium and is of the latest design equipped with two projection machines, four spotlights and one stereopticon. The direct-current circuits are controlled from a switchboard arranged to throw each machine across either the d.c. service from the stage motor-generator set or across the projection room generator-set service.

Return call buzzer stations between the stage manager, orchestra leader and organ console are provided between the projection machine and spotlights. A private phone system between the stage manager and projection room is installed with three phones on the front wall of the projection room, one beside each lookout port.

A complete pilot unit for operation of the stage and house masters on the stage switchboard also is provided on the front wall of the projection room. This permits the operation of any lighting effects on the stage and house, the set-ups having been made on the stage board.

The Pavilion Building

The three-story pavilion building has an exhibition hall and a banquet hall and is 300 x 150 ft. with a wing 120 x 75 ft. adjoining the lobby of the auditorium building.

The basement of the wing is used for boiler and fan rooms and transformer vaults for the exhibition and banquet hall. Portions adjoining the auditorium are used for foyers and passageways from both

the auditorium and banquet and exhibition halls. The balance of the first and second floor is used for kitchens and service rooms, with living quarters for the caretaker on the second floor.

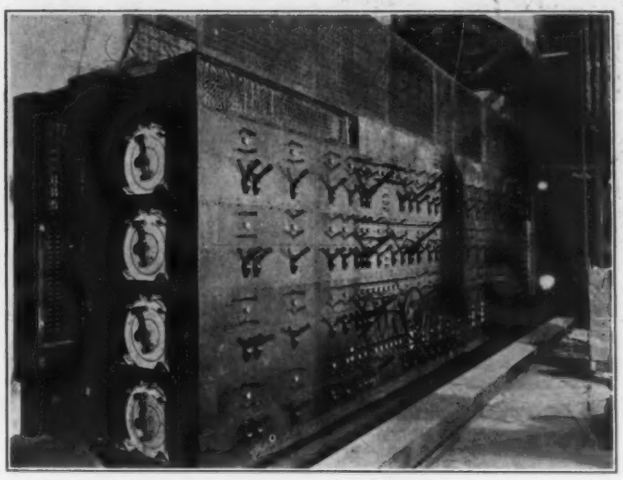
The main basement is designed for an exhibition hall. Two ramps provide direct access to outdoors. The main lighting is provided from ceiling outlets. Each column has a 1,000-watt receptacle circuit to provide for additional decorative lighting. Special power gutters for carrying three-phase and single-phase power lines to booths have been installed along both side of two ventilating ducts run exposed on the ceiling. Each gutter consists of two 4 x 4-in. sections mounted one above the other and provided with hinged covers. Heavy leads will be laid into these gutters from which taps can be taken to the booths through holes drilled in the covers.

The second floor of the banquet hall is a mezzanine entirely surrounding the first floor, and leaving an open space 64 x 213 ft.

All the lighting in the banquet hall is arranged for two-color control, the circuits being run to three panel boards distributed about the building and controlled from a switchboard in the kitchen wing. A receptacle with a 1,000-watt circuit is provided on each column under the mezzanine for decorative lighting when the room is used for exhibitions.

The mezzanine extends approximately 13 ft. inside the line of columns. At the railing, and in line with the columns, free standing indirect lighting pedestals have been installed.

A special power gutter for the first floor and mezzanine is run along the ceiling of the first floor just inside the line of columns. This gutter is 4 x 8 in. divided into two 4 x 4-in. compartments arranged side by side and equipped with hinged covers

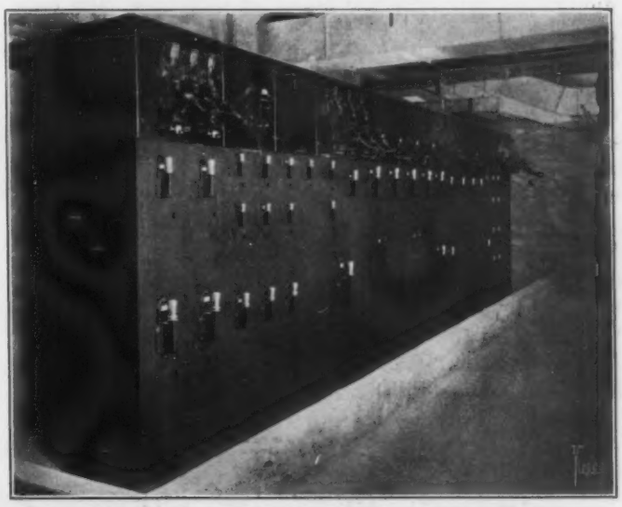


The stage switchboard at the Shrine auditorium, the largest stage switchboard so far constructed, is a Hub Electric Company pre-set, selective, remote-control board. It is 26 ft. long and has 152 main pilot switches and 279 dimmer plates.

with turn catches. Straps $\frac{1}{8}$ x 1 in. spaced 24 in. on centers support the cables when the covers are open. Cast iron boxes 8 x 8 in. with gasketed covers through the mezzanine floor connect with the gutters below.

The special power gutters are connected to a distribution switchboard in the basement with 4-in. conduits, one conduit connecting with each gutter section. Three-phase and single-phase 600-amp. leads are brought from the main exhibition hall service switchboard to the distribution board.

A 4-in. conduit only also is provided from the outside of the building to the distribution board for



Main distribution switchboard at the Shrine auditorium, showing side view of the control panel (on extreme right) for the 150-hp., 2,200-volt motor of the 3-unit motor-generating set which provides direct current to the stage.

bringing large capacity direct-current feeders from the portable engine generator sets for dances and entertainments, requiring arc lights and color wheels.

Heavy capacity pockets are provided in seven of the ceiling trusses from which festoon lighting can be extended.

Electrical service for the two buildings is provided from four transformer vaults, two in each building. One service company supplies all the lighting in both buildings, the other company the power and the standby lighting.

The power service in the auditorium building consists of three 200-kw. transformers for light, two 100-kw. for standby light and three 50-kw. for power. In the exhibition and banquet hall building it consists of three 100-kw. for light, one 15-kw. for standby light and three 50-kw. for power. An additional transformer vault is provided in the exhibition hall building in which extra transformers can be placed to supply additional special power for various commercial uses during exhibitions.

Separate service switchboards are provided in each building so that electrically the two buildings are separate units, with the exception of certain lobby lights in the kitchen wing which are used for both the auditorium and banquet hall. All services entering these main switchboards are protected with I-T-E circuit breakers, using type L.L. and L.G. as required.

Power service for the heating and ventilating system and the organ is supplied in the usual man-

ner, the organ blower being controlled from the console.

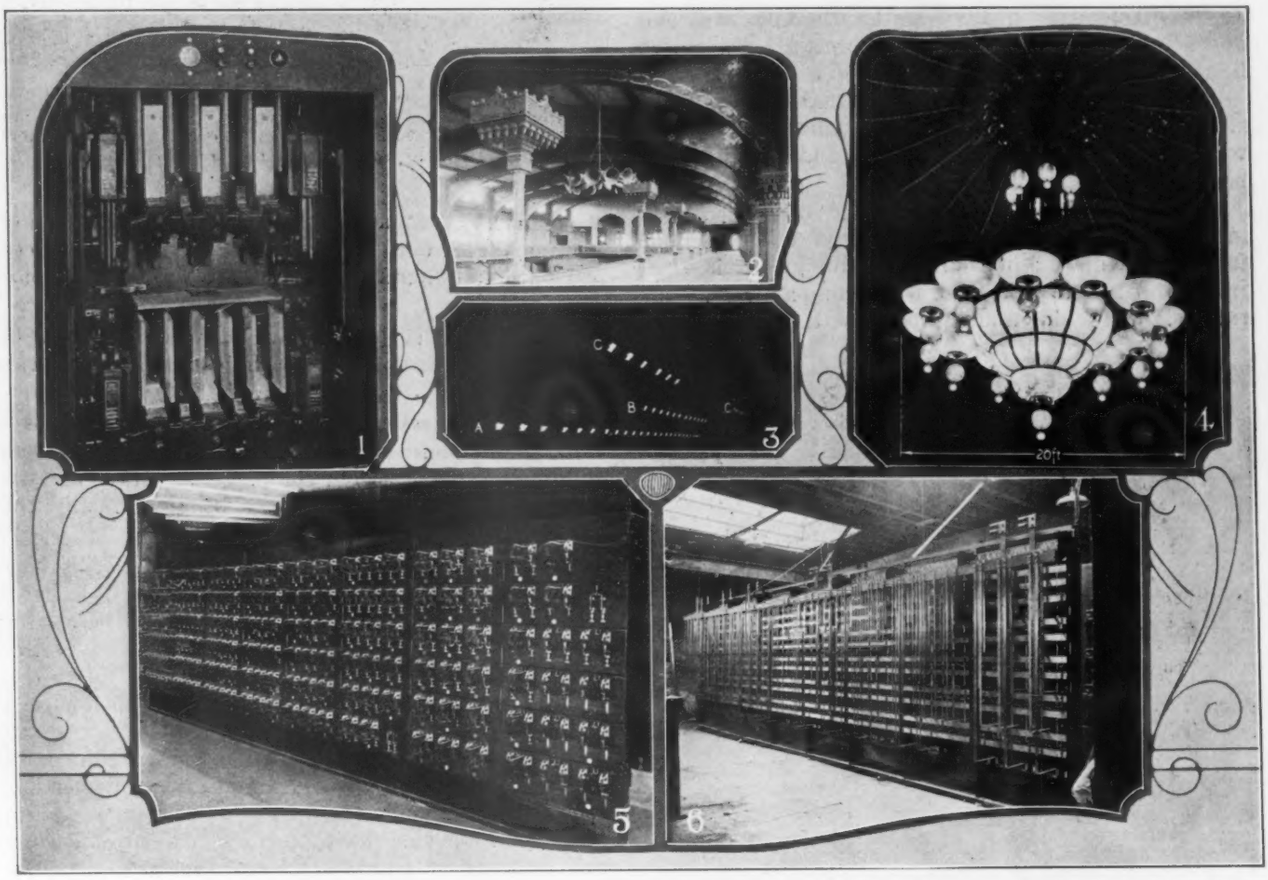
Three 110/220-volt, 1,600-amp. lighting phases are used in the auditorium building. One goes direct to the stage switchboard contactor board, the other two are split to feed the contactor board and the several panel boards throughout the building. Two of the leads feeding the contactor board are connected on the load sides of two Sunhd remotely controlled transfer switches of 600 and 400-amp. capacity, respectively, which normally are fed from the lines of the standby power company. The third lead is carried direct to the contactor board. The two circuits which are on the transferred services are used to feed the operating buses of the remote-controlled switchboard and the footlights and borders No. 1 and 2, switchboard lights and certain other circuits on which power must be maintained. The transfer switches are operated from the stage manager's station, pilot lights being provided to indicate when the normal services are "hot" and when the standby services are being used.

The auditorium building emergency lighting service is taken from the load side of a Sundh semi-automatic transfer switch, which transfers automatically to the standby company on a reduction in voltage below 200 volts. Pilot lights are provided on the service switchboard and at the stage manager's station with the same features as mentioned above for the stage transfer switches. Reset switches are located directly below the pilots.

The lighting service of the banquet hall building consists of one 1,000 and two 800-amp. 110/220-volt phases. An emergency lighting transfer switch similar to the one for the auditorium building is provided for the banquet hall building with resetting stations on the service switchboard and the banquet hall master lighting switchboard.

Public Address System

A public address system has been installed which makes it possible not only to amplify the oral action on the stage into the auditorium but into the banquet hall and exhibition hall at will. The system can be used in the banquet hall alone to amplify speeches and also can be used with outside horns at the main entrances of the auditorium and banquet hall to address overflow gatherings.



Representing some of the more interesting features of the Shrine auditorium electrical equipment: (1) A close-up of one of the Sundh semi-automatic transfer switches on the main switchboard (shown elsewhere). (2) A view from mezzanine floor of the banquet hall in the pavilion building, showing the Western Electric public address system horns installed, and the fixtures on columns from which the ceiling is floodlighted. (3) Because of the extreme stage width borders have been designed to accommodate smaller stage use. (a) Shows full proscenium concert border, (b) the center section of another border separated for short proscenium use, with (c) the two end sections of the same border drawn up. (4) The immense chandelier which hangs from the center of the auditorium, weighing 5 tons, 20 ft. in diameter, 28 ft. in length, and having an electric load of 65 kw. (5) Front view of the remotely controlled contactor panel, operated by the stage switchboard. This board is 24 ft. long and contains 142 contactors. (6) Rear view of the same contactor board, showing the bracing.

At the conclusion of the meeting, it is adapted to summon cars, transmitting outlets being provided in each of the vestibules. Meetings in either of the buildings can be broadcast by remote control over telephone lines through one of the large radio stations. The system also is equipped with a radio receiving set by which messages from speakers who are unable to attend may be broadcast from other cities and heard at the conventions.

Outlets for the public address horns are located at two points in the banquet hall. This makes it possible for the speaker's table to be located either at the end of the room or at the center near one side. The outlet for basement horns is located in the center of the room.

Auditorium horns are concealed in the ornament over the proscenium arch.

Both buildings are provided with a complete conduit system for the installation of public telephone service. Provision is made for a P.B.X. board in the exhibition hall so that lines can be extended readily to any booth during exhibits.

A Western Electric selective ringing intercommunicating telephone system is installed for communication between the administrative offices of the auditorium, the several foyers, the stage manager, projection booth, green room and so forth. There are thirty-three stations on the system, and the connections have been so made that each station is able to talk with such other stations as is necessary.

George L. Patterson, of Los Angeles, was the electrical contractor for the job.

Efficiency and Public Relations

By Mrs. Lewis A. McArthur, Portland

A GOOD many people today are wondering whether or not effective organization in certain businesses has not grown from an active little lizard, adapted to getting about quickly, into an unwieldy dinosaur, which carries about forty tons of body to eight ounces of brain. Some who feel that the lizard certainly has reached the proportions of Mr. Beebe's now famous marine iguana are already a little diffident about saying so lest they come in contact with its claws.

Just what is organization, this term of uncertain proportions? What is its correlate, "efficient organization?" The common-sense definition of organization may be stated as the arrangement of work in such an ordered system that it is done with the least duplication of effort and loss of time and strength.

The necessity for some sort of organization of effort is evident. The need of sparing the brain and saving the capacity of workers from routine fatigue and unnecessary loss of time is therefore an integral function of organization. To be efficient is not just to be in good form, or perhaps it would be truer to say that to be efficient is indeed to be in good form. Efficiency is the polishing of the connecting link between work and workers. It is as important to know that it is actively present in your business as it is to know that the gears of your automobile are of a type and condition to keep your car running when you need it. It does not pay the manufacturer to expend more than a sum proportionate to his entire output on perfecting the gearing of your car. Improvement of the gears alone without accompanying progress in the manufacture of other parts of the car might result in disastrous accident. It is possible to over-refine one part at the expense of another. Just so efficient organization reaches its own point of diminishing returns.

There are other gages of success in business besides efficient organization. There is, for instance, satisfactory service to the public which, in the case of the utilities, organization was devised to serve. There is also the question of generous dealing with employees. Efficiency in the utility business may be said to reach the point of diminishing returns when human relations begin to give way to system. The efficient organization capable of replacing one man's work almost instantly with that of another, of functioning not by means of the individual but by disregard of him, tends to emphasize the machine rather than the worker. Yet the worker needs to feel, as a spur to his endeavor, that he is more than a numbered cog in the machine, that in the unconscious order of life he is worthy a place stamped with his own name. The building up of a rigid piece of business machinery may tend to produce extreme competence in a boss otherwise distinguished by lack of ability to develop his men, but it is a handicap to the initiative and self-reliance of the subordinate; and one of the greatest dangers of such a machine is that soon even the boss himself becomes a subordinate. He may be obliged by the governance of system to act contrary to his best judgment and experience. Then what hope is there for the performance of those under him?

The gravest danger to the public-utility industry in extreme efficiency of organization seems to lie in over-application to public relations of principles of uniformity and routine which prove excellent when practiced with regard to other branches of the business, as for instance, accounting. The personal touch is what counts with the public, just as it does with the employee. No remote boss, personally unknown to his workers even by sight, can have the influence of the man familiar with the hopes and problems of his workers and known to have their interests at heart. No brilliant speechmaking, no system of reports, can supply the human confidence which spurs men to creative activity or a favorable vote. Where it is helpful to suggest bits of detail or a rough outline of procedure to any one embarking on a campaign to enlist the good will of worker or public, it destroys personal initiative, responsibility, and, hence, creative interest to offer too much help or to insist upon conformity to a set of rules. It is a mistake to organize such a smoothly functioning machine that you cannot tinker with it, but must be content only to supply it with fuel, oil and water. Like a government bureaucracy, it will in the end run away, not only with those who made it, but also with those whom it was made to serve.

Aspects of Steam Power in Relation to a Hydroelectric Supply

By A. H. Markwart*

Vice-president in charge of engineering, Pacific Gas and Electric Company, San Francisco

Of increasing interest to the industry is the growing importance of steam generation on systems normally considered to be hydroelectric. Load, transmission, and economic conditions have changed during the past decade and these, together with marked increases in steam-plant economies, have restored steam power as a serious competitor of hydro power. Mr. Markwart believes that steam power is needed on a system normally hydroelectric to effect the best system economy, for standby, for meeting seasonal hydro deficiencies, and for meeting dry-year deficiencies. Interesting facts are brought forth in the author's discussion in development and support of these conclusions.

WHENEVER a system load factor is less than unity and when the capital cost of steam plants at load centers with relatively short transmission is less than that of hydro plants with long transmission, it will be economical to carry a portion of the system peak by steam plants. In general, the cost of energy from steam plants at high load factors exceeds the cost of that from hydro plants because of the fuel charges, whereas the cost of energy from hydro plants at low factors exceeds the cost of that from steam plants on account of the higher fixed charges.

Figure 1 shows a load curve having an annual load factor of 67 per cent. It is typical of that of the Pacific Gas and Electric Company which has an annual load factor varying from 60 to 64 per cent. This curve takes the form of twelve daily load curves which are characteristic of the average day of each of the twelve months of the year. It approximately represents the load conditions which have obtained in the past and its form was determined by averaging the loads of the half-hour periods for the days including Sunday of the second week in each month of a selected year. Therefore, in effect, there would be 31 such curves for January; likewise 30 for April. From such a load curve therefore may be obtained by an area measurement, the kw-hr. for an average day for any month, because the area under the monthly curve represents the kw-hr. required for the average day of the month in question. By multiplying such kw-hr. by the days of the month, the kw-hr. demand for the month, and finally for the year, may be obtained.

From this curve was determined the load factor and kw-hr. from base and peak for percentage of system peak from 100 per cent to 32.5 per cent. This is shown by Table I. This curve indicates, for instance, that if 60 per cent of the annual peak from base is carried on hydro plants, 81.8 per cent of the required energy will be supplied on load factor 91.7 per cent. If the remaining 40 per cent of the peak is carried on steam plants, what is left, or 18.2 per cent of the required energy, will be supplied at a load factor of 30.6 per cent.

With this information the cost per kw-hr. from steam plants and from hydro plants may be obtained under various assumptions of oil, money, operation, maintenance and depreciation costs, and of capital cost of steam plants and hydro plants including transmission.

Without attempting to develop this it may be stated that the best theoretical economy in kw-hr. cost under present-day conditions with such a load curve is had by carrying approximately 80 per cent of the maximum demand from the base on hydro, and the remaining 20 per cent from the top on steam. But, as a practical matter, steam in excess of this may be carried without material increase in the cost of the mingled kw-hr., as curves which can be prepared will show that there is comparatively little variation in cost over quite a range either side of the minimum point. Hydro to 75 per cent of the demand, and steam to 25 per cent, may be considered within the range of practical economy. Under this condition the hydro will produce 95.2 per cent of the total annual energy at a load factor of 85.4 per cent, and the steam 4.8 per cent at a load factor of 17.8 per cent.

TABLE I—LOAD FACTORS AND PERCENTAGES OF TOTAL OUTPUT FOR VARIOUS PERCENTAGES OF THE ANNUAL PEAK BOTH FROM BASE AND PEAK[1]

Per cent of annual peak	From base		From peak	
	Load factor	Per cent of kw-hr	Load factor	Per cent of kw-hr
100	67.3	100.00	0.0	0.0
95	70.8	99.96	0.3	0.02
90	74.6	99.89	0.8	0.11
85	78.6	99.36	2.9	0.64
80	82.3	97.91	7.0	2.09
75	85.4	95.23	17.8	4.77
70	87.6	91.18	19.8	8.82
65	89.7	86.73	25.5	13.27
60	91.7	81.81	30.6	18.19
55	93.6	76.56	35.0	23.44
50	95.5	70.98	39.0	29.02
45	97.4	65.17	42.6	34.83
40	98.8	58.75	46.2	41.25
35	99.8	51.96	49.7	48.04
32.5	100	47.95	51.7	52.05

[1] Computed for the load curve of Fig 1 having an annual load factor of 67 per cent

The foregoing remarks apply exclusively to the idea of economic production of kw-hr., all other considerations being neglected. These statements have

* Presented at the Spring Meeting of the American Society of Mechanical Engineers, San Francisco, June 30, 1926.

as their basis primary hydro power and neglect consideration of years of deficient water supply. They also neglect consideration of the amount of

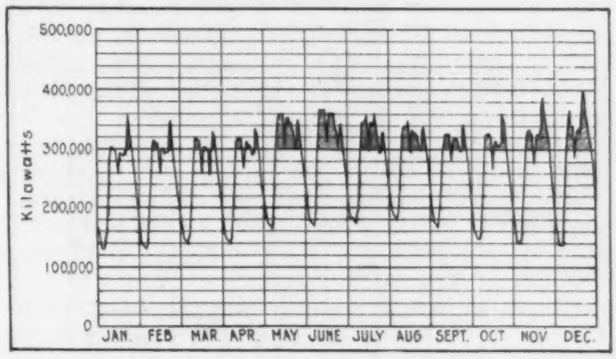


Fig. 1. Typical daily load curve.

energy which might be generated while running steam plants regularly at reduced loads in order for the steam units to be in that operating condition to render possible such service as stand-by implies.

Were it safe to assume the present-day low fuel prices for an indefinite period, steam power for the base load of a regional supply like that of northern California could compete on very favorable terms with the cost of a combined steam and hydro supply, or a hydro supply. Broadly viewed, however, it would appear to be hazardous to assume such a favorable condition, and unsound from a standpoint of fuel conservation, for obviously it is highly proper in a region where water power is available to use such water power as far as it will go, creating for it as favorable a position as possible by the judicious use of steam power.

Steam Stand-By

Various considerations go to fix the extent of stand-by for a regional hydro power supply. The proper amount of steam capacity to be installed in a regional power system for stand-by purposes should be determined by the amount of preferred service required at metropolitan centers served from such a power system, by the character of the load carried, by the kind of general service which is desired, and by other policy considerations. For a metropolitan load center the maximum amount of stand-by which might be provided would be 100 per cent of the expected metropolitan peak at all times. This would be an exceedingly conservative provision. It is probable that 75 per cent protection would be considered adequate in most instances, for as a rule there is more than one transmission line into such load centers. An installation to furnish this protection would have the capacity to reduce the total peak, permitting hydro to furnish the bulk of kw-hr. on the base at an improved hydro load factor. Experience in northern California shows that a regional system equipped with steam capacity based on 75 per cent of the metropolitan peak also will be a system possessing steam reserve sufficient to supply steam kw-hr. on a base load on dry years when the hydro supply is deficient.

Energy production from stand-by plants will vary with the size of the units which are installed or which may be installed from time to time. It will also vary with the hours of operation, or the duration of the hydro system interruption, the amount of stand-by load carried, or the capacity of the hydro or transmission unit which temporarily may be out of service, and the quantity of load that the plant may be required to carry at any instant.

The larger the unit the greater the number of kw-hr. generated even when standing by to take full or partial loads, as units of 15,000 kva. may be operated to carry a minimum load of 1,000 kw. while a 35,000-kva. high-pressure unit probably cannot be operated feasibly with a reduced load of less than, say, 3,000 kw.

As a large system may have several steam plants, the kw-hr. produced from such stations will vary with the number of stand-by plants and the number of units that may be operating in the several plants.

The experience of the Pacific Gas and Electric Company with four steam plants having a total of twelve units, none larger than 15,000 kva., indicates a kw-hr. output of 3 per cent of the total system load as a minimum. This is in addition to that percentage of output which is required to effect the best hydro-steam system efficiency and does not include the steam generation necessary to make up for interruptions to the hydro service. This latter may be large or small depending upon the nature and gravity of the failure in the hydro system.

Steam for Short-Water Season

When the hydro supply is put on a suitable load factor by reason of combing off a portion of peak on steam, the amount of which has been determined by economic study ideal conditions for the hydro do not even then necessarily exist. Conditions would be ideal if the steam-discharge curve were identically the shape of the hydro-load curve which remains after the steam has supplied its complement of peak and energy. For the purposes herein we may neglect the daily fluctuation of load placed on hydro, because, as a rule, this is cared for by forebay capacity. However, monthly conditions are not so easily cared for, because generally storage sites of sufficient capacity do not exist to equate the natural flows on streams where the hydro plants are situated. It then becomes necessary during the short-water season, extending from three to six months, depending upon character of water shed and the year, to build up the difference between the actual and the desired monthly hydro block by pulling steam. This does not mean that steam-plant capacity would be provided in addition to that determined by other considerations, such as stand-by at load centers or steam capacity to meet years of deficient run-off.

It behooves the power companies to use every effort to effect all possible storage to meet the

seasonal short-water condition because it means a saving of fuel which is an important matter, particularly on those years when fuel cost is high.

The foregoing statements relating to seasonal stream flow refer largely to primary hydro power which is available the larger portion of the time. It should be noted, however, that under some circumstances it may be economic to make use of additional steam to permit the absorption of secondary power. Under such a plan of using stream flow, steam-plant operation would be required to an even greater extent than would be required with primary hydro power during the short-water season.

Seasonal steam-generated energy will tend to increase because of the desirability, in the public interest, of absorbing by-product power from storage works erected primarily for irrigation. Since agriculture is fundamental, land for it should be developed to the greatest extent that can be shown economic, proper balance of crop production and demand considered. Such by-product plants must be increased in power capacity to absorb the power of the annual irrigation flow, 60 per cent of which occurs during the three summer months. Power from such plants is largely secondary, as the flow of water is determined wholly on the basis of irrigating the maximum number of acres of land. Under such a condition the seasonal make-up from steam would be greater than that where water is held in such reservoirs to a desired level and discharged at a rate better to answer the power needs rather than the irrigation demand of the maximum number of acres.

Dry-Year Steam

The power companies in California have been operating for about 30 years and reliable water run-off records for most of the streams are available for about 20 years of this time. It appears that the last eight or nine years which cover the period of greatest expansion in the industry have been deficient in precipitation, in fact a number of these latter years have been abnormally dry.

While the run-off records are not available for a long time, fairly reliable precipitation records are. Fig. 2 is a monthly and annual precipitation record for the City of Sacramento for 76 seasons, commencing with the 1849-50 season and closing with the 1924-25 season. While this chart cannot deal quantitatively with the power problem because it does not indicate run-off, it does give a qualitative

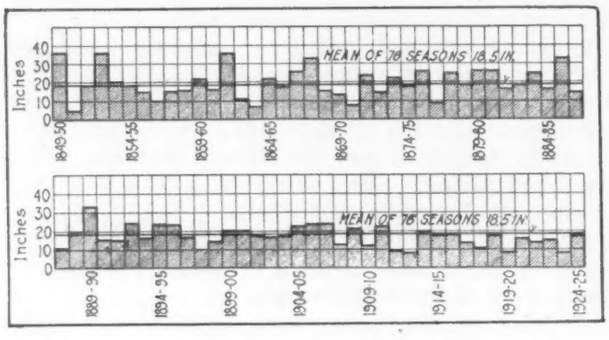


Fig. 2. Annual precipitation record at Sacramento, Calif.

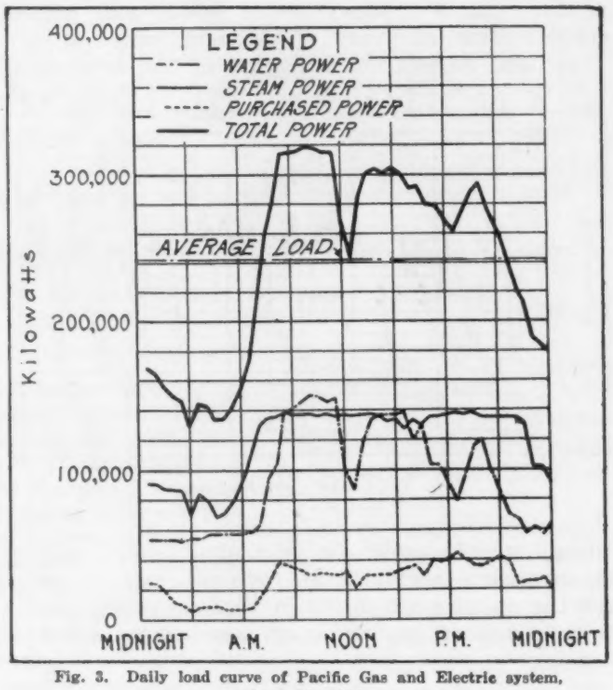


Fig. 3. Daily load curve of Pacific Gas and Electric system, Aug. 21, 1924.

picture of the situation and serves to emphasize future low water yields, as the run-off of the streams of the state of California depend exclusively upon precipitation either in the form of water or snow, except as some of its rivers might be influenced by underground contributions outside of the state such as is supposed to obtain in the case of the Pit River. Even drier years may obtain because it is believed that a period of at least 100 years is necessary in order to measure the effect of all the cyclic changes which might be expected. At any rate, a study of the chart is of peculiar interest at this time. Briefly, the chart says this: The normal rainfall for the 76 seasons is 18.5 in. During the period named the minimum precipitation was 4.7 in. occurring in the season 1850-51, and the maximum was 36.4 in. occurring in the season 1852-53. There were 46 seasons out of the 76 in which the precipitation was below normal, and 30 in which the precipitation was above normal. Of the 76 seasons there were only 24, or one-third that were substantially above normal. A further disappointing disclosure is that the normal as now determined from the available record is going down, this being particularly emphasized by reason of the abnormality of precipitation of the eight seasons preceding the 1924-25 season, two of which were less than one-half normal.

It must be inferred then that power would have had to be supplied to make up the hydro deficiency during those dry years when the water supply fell substantially below normal, if the capacity of hydroelectric development is in general based on flows of years of normal run-off, which is likely. It appears that the last eight seasons have been the longest continued dry period in the 75 of record. As a matter of fact this dry period extends back the last ten seasons if we neglect the 1915-16 precipitation

of 18.3 in. The other dry periods may be noted to be either from two years long to not more than seven years. Of course it is recognized that quantity of precipitation is not the only index as to the water yield of a stream. For instance, the distribution of precipitation in the form of rain and snow in a season having, say, 18 in. might be such as to produce far more beneficial and sustained run-off than would one having 25 in., largely rain, where a bulk of this concentrated in any one month, especially were such precipitation to occur in the early fall before the cold weather comes. Actual run-off, of course, is the real criterion of the power yield of any stream, but as stated above, the chart does give a picture which will suggest a deficiency of hydro energy during the years of deficient precipitation.

Roughly, a system like the Pacific Gas and Electric Company is deficient one-third in energy output on the basis of dry years of severity that have thus far obtained. Actually, the annual run-off of streams in the northern part of the state was deficient a greater amount than this, probably from 40 to 60 per cent, taking 1923-24 as the criterion. The difference in the deficiencies comes about because of the extent to which the streams have been developed. In other words they have not been developed for the high flow which is available for but few months of the year but rather for the flow that is reasonably sustained throughout the greater part of the year as this was known from records available up to the several times of their development.

What actually takes place in dry years as contrasted with normal years is that the steam power takes its position on the base of the load immediately above the load that can be carried by stream-flow plants which are not subject to daily regulation. The portion of the load lying above the steam will be carried on those hydro plants which have forebay regulation, as far as they can, and the final balance by the steam plants, if the steam plants are not already carrying their capacity on the bottom. This normal and dry-year contrast is shown by actual daily load curves of the Pacific Gas and Electric Company in Figs. 3 and 4, the former being for August, 1924, under conditions of drought and the latter being for May, 1925, when water conditions were fairly normal. In both cases, however, the peak pulled was about the same.

Thus, if power consumption is not to be curtailed, power companies must provide the steam-plant capacity required on the dry years, because this is a condition and not a theory. In other words, were it assumed for one reason or another that steam stand-by protection at load centers was superfluous, or combing off the peak because of good economic showing on the hydro was unnecessary, steam would in any event be required to that extent necessary to meet hydro deficiency on these extremely dry years. This steam-plant capacity, as determined by experience, should be in this region of the order of 40 per cent of the anticipated system peak, and it may even be greater than this in other portions of the state.

As a coincidence resulting from the relation which exists between the metropolitan and system peaks on the system of the Pacific Gas and Electric Company, a steam-plant capacity of 40 per cent of the system peak will approximate 75 per cent of the metropolitan peak. This will of course change as the relation changes, and as more hydro plants are built on streams of sustained flow like the Pit River or on streams which may be regulated by storage works. As has been stated, the kw-hr. production of the hydro system as now developed in northern California is deficient, during dry years, to the order of one-third. This deficiency may be made up readily from steam-generating stations having a capacity of 40 per cent of the system peak or 75 per cent of the metropolitan peak. For example, with a system peak of, say 400,000 kw., of which 213,000 kw. is the load of metropolitan centers, steam capacity of 160,000 kw. at load centers would be sufficiently great to furnish the deficient hydro kw-hr. to the general system on dry years when employed on the base, and normally furnish suitable protective capacity at metropolitan centers. Likewise, this steam capacity would permit combing off the peak under normal operation to any amount that was desired to improve the hydro load factor to bring the best system economy.

As an operating problem on dry years, if during the precipitation period it appears that the stream yield for the coming run-off season is likely to be deficient, it becomes necessary to use good judgment in the holding of stored waters and the burning of oil during the spring months so that, in the late summer, the power available from steam plants and used on the base, together with power available from reserved waters when used in the top, will be sufficient to meet the anticipated load.

Under such conditions the steam plants, up to

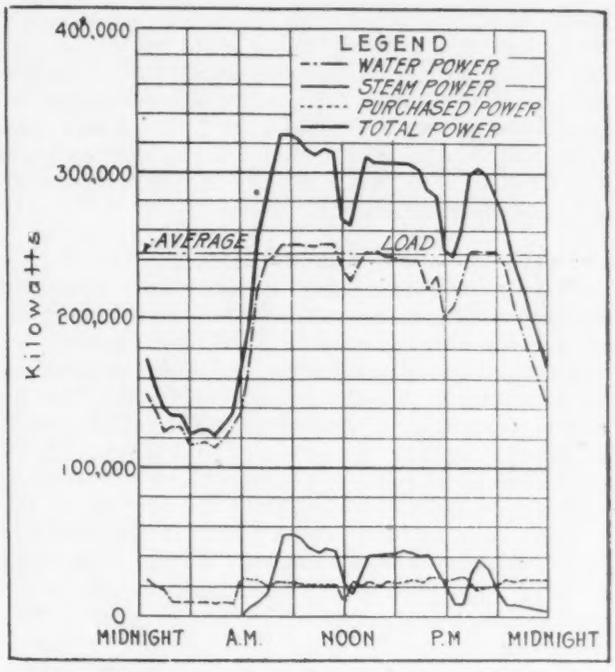


Fig. 4. Daily load curve of Pacific Gas and Electric system, May 5, 1925.

their capacity, must take of the total load, a block of a size as determined by the amount that the hydro of waters held in storage will meet. Thus during a dry year, the variations in loads are taken up by stored-water plants, whereas, in normal years, variations are taken by steam plants and stored water, except as daily variations are concerned, serving together with the stream flow to meet base-load requirements.

While the maximum overall economy of a regional system in normal-water years is had at present by generating the maximum of hydro energy at a high load factor and the minimum of steam energy at low load factor, it is desirable in the interests of economy to use stored water through hydro plants in a manner which will permit the highest possible daily load factor on steam for the obvious reason that the kw-hr. from a unit of fuel increase as the load factor improves. In modern steam-turbine plants, with boilers of 400-lb. pressure, it is possible to produce 400 kw-hr. per barrel of oil at load factors of 70 per cent and above, with less as the load factor lowers, down to perhaps 250 kw-hr. per barrel with a load factor as low as 10 per cent. While on normal years it may not be possible to operate for ideal fuel consumption, it is quite possible to do so in dry years. In such years, when annual costs become an important consideration the load factor on steam will be high with corresponding steam-plant efficiency.

Normally, steam plants must be used to supply kw. of peak, if this function can be imagined, instead of kw-hr. of energy, leaving the hydro to supply the bulk of the energy requirements. Under such condition there will be but a minimum of oil consumed, as the amount of energy required from steam when supplying the selected portion of the peak is relatively small.

On dry years, however, steam plants must be used to supply the kw-hr. of energy of the base load. At this time operating costs become a very important consideration because of the unproductive investment in hydro plants. Therefore, to improve the economic situation, the hydro plants must be operated in a manner that will produce the highest possible load factor on the steam plants, with corresponding steam-plant efficiency.

Hydro Capacity

The desired steam-plant capacity in a combined system will be determined by the various considerations elsewhere mentioned. Hydro capacity on the other hand is involved solely with the question of economy in kw-hr. production. With the increase in distance of transmission, larger capacities of generating and transmission units, and higher capital costs of such over steam plants, it becomes necessary to install hydro plants to operate on the highest possible load factor. This is accomplished by combing a proper amount off the peak with steam plants, leaving the base load, containing by far the greatest number of kw-hr. for hydro. The hydro-plant capacity must then be that which is necessary to meet the remaining and larger proportion of the load. And streams should be developed for the flows regulated or unregulated as may be possible on normal years, with steam to make up the hydro deficiency on subnormal years.

To illustrate again with the example of peak load of 400,000 kw. neglecting the question of spare capacity which becomes a matter of judgment, a system with an annual load factor of around 60 to 65 per cent would have a hydro capacity of 75 per cent of the peak from the base, or about 300,000 kw. This, together with the steam-plant capacity of 160,000 kw., brings the system capacity to 460,000 kw., with kva. higher, as may be required by power-factor conditions.

Cost of Power

The cost of power from such a regional system naturally will vary from year to year. The total of fixed and other annual charges on hydro and steam-plant capacity will remain substantially the same irrespective of the output, whereas the fuel charge will vary depending upon the hydro deficiency. In dry years a portion of the hydro-plant capacity will be non-productive, and in wet years this condition will obtain with respect to steam-plant capacity. Because of this, the cost of power is therefore not constant, even though unit fuel cost and fixed charges be stationary over a long period of time. However, the average cost of energy may be ascertained with reasonable accuracy but only if a period of years which contain a dry cycle is considered. It is possible to make a summation of annual costs for such a period and apply these to the total of kw-hr. expected from hydro and steam plants for the period, thus obtaining a period average unit cost of energy. The total cost will be made up of the fixed charges on the capital invested in hydro including transmission, and in steam plants, plus operation, maintenance, depreciation, and similar costs on both, plus the fuel costs over the period considered.

Conclusion

In the final analysis the relative development by a utility of hydro and steam generating capacity is a problem of economy; and the natural resources which are available, the character of the load to be carried, the rate at which energy must be supplied or the load factor, the extent to which other utilities may depend upon it for stand-by, and other related elements furnish the criteria for its solution. This can be illustrated by reference to the measure of steam capacity prevalent with several of the utilities of this region. The steam-plant capacity of the California Oregon Power Company, a utility with a small load, is nil, as it serves a sparsely settled territory, and its hydro plants enjoy a fairly dependable water supply. The Great Western Power Company has a steam-plant capacity of approximately 20 per cent of its system peak, relatively small but doubtless justified because of its interconnections and extensive storage capacity which is provided for regulating the stream on which its hydro plants are situated. The Pacific Gas and Electric Company, and the Southern California Edison Company, who jointly furnish about

70 per cent of the energy for the state, each have a ratio of steam to hydro capacity which corresponds fairly closely with that outlined in the foregoing. The Los Angeles Gas & Electric Company operates steam plants exclusively, as it serves a city with a high load density, and cheap fuel in the form of natural gas and oil is readily available.

The general tendency seems to be for the steam-plant ratio to increase slightly. The central-station construction program for eleven western states for the three-year period 1924 to 1926, inclusive, is as follows:*

	Hydro-kva.	Steam kva.
1924	243,223	139,500
1925	314,625	87,500
1926 (projected)	194,550	145,000
Total	752,398	372,000

*From Journal of Electricity, Feb. 1, 1926.

For these three years, the ratio of steam-plant construction to the total is 33 per cent. The installed generator capacity on Jan. 1, 1925, for eleven western states is given as 3,084,974 kw., of which 30 per cent or 935,783 kw. was steam.

The steam ratio will probably remain fairly constant, but with a slightly increasing tendency until the majority of the more favorably situated hydro projects are developed. To predict further into the future is impossible on account of the uncertainty of the cost of fuel. At the present rate of growth the hydro resources will not approach complete development for another generation. The cost of fuel oil may and probably will increase, but the supply of low-grade coal which can be substituted will keep the cost of steam within reason, thus permitting fuel to continue to be a factor in the economic development of the remaining hydro resources.

Selling More Than 2,000 Ranges in Two Months

By Robert W. Lindley

Merchandise Sales Manager, Puget Sound Power & Light Company, Seattle

NOT to cause embarrassment to a modest worker did the Journal of Electricity solicit this story of a truly remarkable achievement, but rather to bring to its readers the details of how it was done through planning, co-operation and hard work. Mr. Lindley, whose job it was to co-ordinate all the effort put into the campaign, has submitted the story to us in this spirit.

THE American people's love of a record of almost any sort in work or play is not the only incentive for telling the story of the sale of 2,043 electric ranges in two months on the system of the Puget Sound Power & Light Company. This sale is believed indeed to be a record in numbers sold by one utility company in a short campaign. In addition, it represents selling a high percentage of prospects since the total figures to slightly more than three per cent of the 64,000 residential customers not having ranges at the start of the campaign. But beyond this fact and greater in importance to the industry is the revelation of what can be accomplished by co-operative planning and execution—co-operation between the manufacturer and the utility company, and co-operation between the sales department and the other departments within the utility company—in fact, by the combined efforts of the manufacturer's representatives, the sales department and all the employees.

Other campaigns conducted by the company have offered just as much inducement to customers to buy, and in other campaigns the effort expended has been as great, but probably in no other campaign were the plans more carefully laid nor more meticulously executed with as fine a co-operation of effort on the part of the personnel of the company.

A Hotpoint range sales campaign has been for some years an annual spring event with the Puget Sound Power & Light Company. In preparation for this one the proposal of the manufacturer was discussed at the annual district sales managers' meeting held in January in Seattle. A complete campaign plan was presented at this meeting and approved by the sales managers. The dates set were April 1 to May 31, inclusive, and, as in the case of a military offensive, a deal of preparatory work was set for completion prior to the firing of the opening gun. This work was primarily that of the manufacturer and included the conducting of a number of newspaper cooking schools throughout the territory served by the company. These schools, which were operated on the standard plan of the Edison Electric Appliance Company co-operating with a local newspaper to create general public interest, were held at Seattle, Mt. Vernon, Anacortes, Olympia, Chehalis, Wenatchee and Everett, Wash., seven key towns in different districts of the company.

A second feature of the preparation was the educational work among the employees, which was accomplished by special range dinner meetings held in each district of the company to which the district managers, district sales managers and the operating

personnel were invited. At these the general plan of campaign was announced and explained to all present, and a range sales talk was delivered by R. J. Cordiner, factory representative of the manufacturer. Fourteen of these meetings pretty well covered the seven districts of the company and brought together a total of 600 employees.

Newspaper cooking school conducted by the Edison Electric Appliance Company at the Masonic Temple, Seattle, in preparation for the range campaign of the Puget Sound Power & Light Company.

Terms, Premiums, Commissions, Prizes, Quotas

Detail plans of the campaign included offering the ranges at company cost plus 25 per cent when sold for cash, and cost plus 34½ per cent when sold on time. This comparatively low price, coupled with the maximum easy terms of $10 down and the balance in eighteen months, furnished the principal incentive to customers to buy during the campaign period. In addition, a premium of an immersion water heater, or $7.50 allowance on any other electrical appliance, was offered to each purchaser.

The regular commission salesmen of the company were paid a 10 per cent commission on the cash price of each range sold. Employees in other departments received 5 per cent commission on the cash price for making a sale, or 2½ per cent for registering the name of a prospect to whom a range was later sold during the campaign. On such sales an additional 2½ per cent commission was paid to any other employee completing the sale.

Considerable additional interest among employees was created by the offer of special prizes to be competed for by districts. The first prize, a large silver loving cup known as the H. J. Gille Trophy, named for the general sales manager of the company, was placed in competition to be awarded to the district reaching the highest percentage of its quota. Individual prizes also were offered to all employees for selling the greatest number of ranges. The first prize in this class was a complete electric kitchen equipment consisting of a Hotpoint white enamel range, a water heater, a toaster and a waffle iron.

The territory served by the company is divided into seven districts of varying size and extent. In assigning quotas of range sales to each district due consideration was given to the number of residential customers in each not possessing ranges at the start of the campaign, and to whether or not the company served gas in any of the towns of the district. As finally allotted, these quotas, excluding possible sales to apartment houses, were as follows:

Central District, Seattle	537	Ranges
Southwestern District, Tacoma	200	"
Northeastern District, Everett	200	"
Northern District, Bellingham	193	"
Eastern District, Wenatchee	175	"
Southern District, Chehalis	85	"
Western District, Bremerton	110	"
Total	1,500	Ranges

Results Attained

Although this quota was larger than any heretofore assigned in a similar campaign, it was felt that it could be reached, and when the sixty days of concentrated effort netted 1,681 ranges sold to residential customers, or 112 per cent of the quota, it was seen that the optimism of the sales department had been justified. In addition to the number sold to residences, it was gratifying to note that 362 ranges had been placed in apartment houses

The H. J. Gille Trophy which was in competition among the districts of the Puget Sound Power & Light Company, Seattle, during the Hotpoint range campaign of April and May, 1926. The cup was won by the Northeastern District, consisting of territory around Everett.

throughout the districts, bringing the grand total up to 2,043 ranges, of which 1,913 were Hotpoint. Practically all districts exceeded their quotas, the H. J. Gille Trophy having been won by the Northeastern District, Everett, with the sale of 341 ranges, or 170.5 per cent of its quota. The district grand prize of $100 also was won by this district, and its sales manager, H. S. Atwood, carried off the sales manager's prize of an electric ironer presented by the Pacific States Electric Company.

Some truly remarkable individual records were made. Among these was that of the winner of the first prize, consisting of a complete electric kitchen presented by the Edison Electric Appliance Company, C. W. Sherman, light and power salesman, Bellingham, with the sale of 98 ranges. The second prize, a sewing machine presented by the Graybar Electric Company, for the greatest number of water heaters was won by Gordon Gallagher, Bellingham, while C. H. Gillespie, light and power salesman, Everett, won the third prize, a Premier Duplex vacuum cleaner presented by the Edison Electric Appliance Company, by selling 70 ranges. The work of a number of other salesmen who approached these records was also very gratifying.

Contributing to the success of this record-breaking campaign was of course the newspaper advertising carried on over the entire system of the company, and the selling demonstrations held in several offices of the company. It is estimated that some 1,200 interested women attended the latter, and those of

Three of the advertisements used in the successful range campaign of the Puget Sound Power & Light Company during April and May, 1926.

them that did not become purchasers during this campaign doubtless will be excellent prospects in subsequent ones. The comparatively low price and attractive long-term payments, along with the added inducement of a premium, was of course a factor in inducing purchases during the campaign period. It is interesting to note that over half of the purchasers took the water-heater premium, thus contributing materially to the $111,000 annual revenue added. The excellent revenue-producing qualities of this premium and its general acceptability to range-users would seem to indicate that it was, from the company's standpoint, a particularly desirable one to use.

It is also interesting to note that the gross sales value of the ranges sold was in excess of $250,000 and that an analysis of the final results has shown a merchandising profit. It is believed that had the same volume of sales been extended over a period of time longer than two months, there might not have been a profit because it is only through concentrating for a short time that campaign expenses can be kept down. This is an element of merchandising ranges which makes this company believe in short, high-pressure campaigns as against effort longer drawn out and less intensive.

It should be remembered in connection with this campaign that the company has been pounding into the consciousness of its customers for years the facts that for many reasons electricity is the best fuel for cooking, that the electric range is no longer in the experimental stage, that there are several thousand in successful operation on the company's lines, and that electric cooking is not expensive. The result of this long-continued effort has been accumulative, and each year the resistance is less. But to sell a quarter of a million dollars worth of merchandise in two months requires something more than accumulative effect of past effort, and in a word the success of this campaign may be attributed to following out Mr. Gille's carefully laid plans and to the co-operation secured from the entire company personnel. In maintaining a high pitch of enthusiasm among the employees the influence of the district sales managers was felt particularly, and the work of R. J. Cordiner, factory representative of the manufacturer, was at all times helpful.

Service Manual Issued by Pacific Gas and Electric Company

DESIGNED to answer many of the questions which might be advanced by present or prospective consumers, a twenty-four page service manual has been issued by the Pacific Gas and Electric Company as a guide to its service. The purpose of the booklet is to present suggestions calculated to show consumers how to take the best advantage of the gas and electric services offered by the company and how to get from them the maximum in comfort, convenience and usefulness.

The booklet contains sections devoted to applications for service, methods of establishing service, deposits, and many pages devoted to the subjects both of gas and electricity. Among the topics discussed in the section on electricity are voltage, fuses and fusing, lamps, various appliances, and instructions regarding meter reading. Indicative of the new trends in the industry is a section devoted to the subject of radio noises.

The manual was prepared by the publicity and advertsing department of the company under the direction of J. Charles Jordan, advertising manager.

CENTRAL STATION CONSTRUCTION OPERATION AND MAINTENANCE

Cable Car Design Incorporates New Safety Features

A new-type, safety cable car has been devised by the chief structural draftsman, C. C. Galsbraith, of the Portland Electric Power Company. This car is for use in connection with the construction and maintenance of that company's 57-kv. transmission line from its Oak Grove plant.

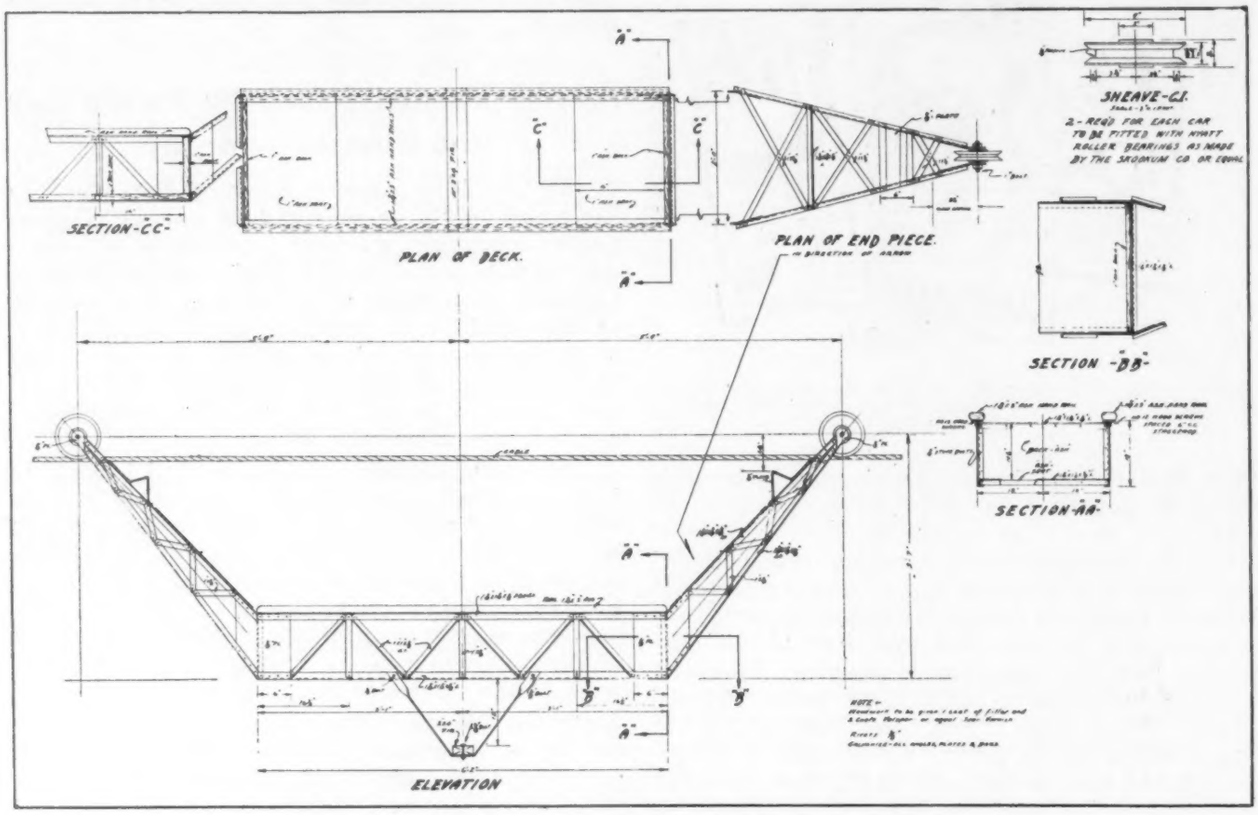
The right-of-way for this transmission line follows the canyon of the Clackamas River for several miles. Rather than follow all of the minor curves and bends of the river the line crosses the river some twenty-eight times. In fact it was necessary to cross the river this number of times in order to minimize the number of angles in the line and to find suitable foundation space for the towers. The main mode of access to this project is via the company's railroad line which follows the river closely and is located entirely on the north bank of the river. Thus it will be apparent that 14 sections of transmission line are across the river from the railroad.

To make accessible these otherwise isolated sections of line 14 cable ways were constructed across the river. These were designed to transport both men and material and to serve for maintenance work during the life of the line as well as for use during the construction period. The ordinary type of car used by stream gagers and others who from time to time have improvised various cars for this class of trans-river service has a serious disadvantage in the liability of injuring the workman's hand between the cable and the sheave. With this fact in mind a special design was worked out which obviated this danger.

S. F. New, general line foreman, Portland Electric Power Company, riding in one of the safety cable cars.

As shown in the accompanying illustrations, the ends of the car are carried well out beyond the body instead of being brought up vertically as is the more usual practice. This construction puts the sheave well out of reach of the car operator. As an additional precaution against possible accident there is a light, bent metal plate fastened to the car end-frame just under the sheave. This is designed to break the grasp of the hand from the cable before any damage from the sheave could result.

Seats and hand rails are of hard wood treated with a coat of filler and two coats of high-grade spar varnish. Hyatt-type roller bearings give an ease of operation that is desirable and costs little. All metal parts are heavily galvanized to resist the weather action. Propulsion is by means of a clamp-type "puller" which will slide freely on the cable when it is in a vertical position but which grips the cable positively when the handle is deflected either way from the vertical position. This of course makes it normally unnecessary for a man to have his hands on the cable and serves as an additional precaution against injury.



Design details of safety cable car used by Portland Electric Power Company.

The cars are designed for a 1,000-lb. load, weigh about 165 lb. complete, are supported on ¾-in. cables fastened to suitable stumps or trees and wherever the distance above the ground is appreciable at all a landing stage is provided. The total cost of the cars complete with hard-wood seats and hand rails, galvanized finish and roller bearings was about $75 each.

Frequency Relay Built from a Voltage Relay

By L. F. HUNT, Development Engineer, Southern California Edison Company, Los Angeles.

About two years ago the Southern California Edison Company called into use some 60-cycle generators for service on the 50-cycle system. These units were very sensitive while operating at 50 cycles and the governing apparatus could not be adjusted satisfactorily. In order to use them without hazard to apparatus a frequency relay was required to trip the machines at but a slight overspeed. It was not practical to get a frequency relay from the

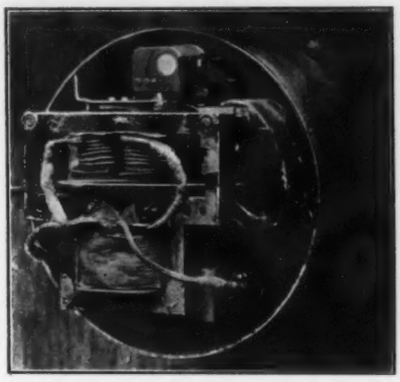


Fig. 1. Emergency frequency relay.

manufacturers on account of long delivery dates. In order to hasten this protection a frequency relay was made in the experimental machine shop of the Edison company.

The relay was made from parts of a Westinghouse CV relay. The slotted disk was replaced by a solid OA meter disk. The moving contact was connected by means of a very weak spring fastened so the contact floated just at the opened position. A second CV electromagnet was mounted an equal distance in front of the disk axis as the original element was back of the disk. A small I-14 damping magnet was placed between the outer electromagnet and the movement frame. This arrangement may be seen in Fig. 1.

The electromagnet tending to close the contacts was connected in series with 3 micro-farads of telephone condensers across the line, while the electromagnet tending to hold the contacts open was connected in series with a resistor across the line. In this particular application it was desired to have the relay adjusted to trip on frequencies above 51.5 cycles. The adjustment was made by adjusting the external resistor to the proper value of resistance. Since the CV electromagnets are identical and "Ideal" nil-temperature-co-efficient wire was used on the resistor, the temperature error of the relay was negligible and the

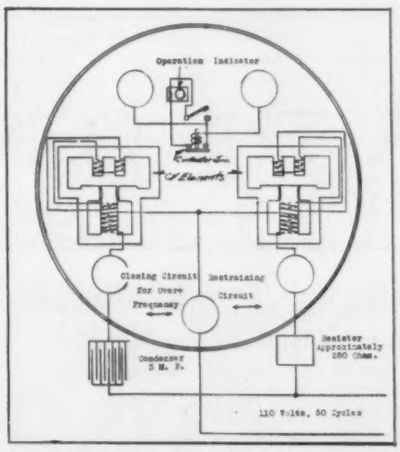


Fig. 2. Schematic wiring diagram and arrangement of emergency frequency relay.

voltage error from 80 to 120 volts was practically zero. The electrical connections are shown in Fig. 2.

The relay, when its contacts closed, tripped the generators from the system. An over-voltage CV relay also was used in parallel with the frequency relay, since in cases of overspeed the voltage and frequency tended to rise together.

During the several months of operation, the frequency relay operated several times and give satisfactory service.

Polyphase Meter Check Method for Difficult Jobs

By WILLARD JOHNSON, Roseburg, Ore.

Many difficulties present themselves to the meter test crew. Not the least of them are those incident to the older and perhaps more isolated installations.

Large blocks of industrial power invariably are metered through instrument transformers and a polyphase meter. Errors in metering at such locations are costly to the power company serving the installation. The liability of errors within the meters themselves is comparatively small, but an error in connections is quite possible and may cause as much as 30 per cent difference in meter indication. In many of the older installations the metering leads are taken through conduits for some distance, with no provision made for access for test and with no identifying marks on any of the leads.

Several jobs have been discovered where it is impossible to get at the leads from the transformers to the meter to trace them out or even to ring them out. However, in some cases access may be had to the secondary leads from the instrument transformers and in those cases there is a method of checking that works nicely.

Cut the current coil of a single-phase standard in series with the secondary of one of the current transformers at the transformer. Connect the potential coils of the standard to the potential transformer corresponding to the current transformer just mentioned. This connection puts the single-phase standard in series with one of the elements of the meter it is desired to test. By disconnecting the other element of the meter under test and making the test run, a direct comparison may be made between the standard and the one phase of the meter under test. If that particular element of the meter under test is connected correctly the indication of the meter under test and the indication of the standard will correspond. Of course, the same test method then may be applied to the opposite phase.

This method has served well in several difficult cases.

Special Motor Truck Facilitates Line Maintenance

A Mack truck specially fitted up for the job is used to advantage in the maintenance of the Los Angeles Gas and Electric Corporation's two 110-kv. transmission lines between Los Angeles and the Seal Beach steam plant. The truck is used by the crew which constantly patrols the lines between these points keeping the insulators cleaned. The interior of the truck is fitted with two seats placed lengthwise of the body. These seats are upholstered for the comfort of the crew,

Specially fitted truck used by line maintenance crew.

and storage space is provided in the boxes beneath the seats for carrying the crew's regular equipment. As shown in the accompanying illustration, storm curtains are provided for protection in stormy weather. Full balloon tires are used on all four wheels, double on the rear wheels.

"The Useful White Ant"

"The name of the white ant, or termite, so long has been a synonym for destructiveness that it is surprising to learn that it has its good points," states The Literary Digest. We quite agree with the statement.

It seems that the Termes Bellicosus performs an economic service for the natives of a former German colony in East Africa. The ground there is reported to be a coarse soil derived mostly from the weathering of granite rocks and the natives do not have the art of fertilizing or improving the soil. The termites crumble the soil in a manner similar to our earthworms. Further, they carry from deep beneath the surface a good grade of loam and with it build their mounds on top of the ground. These mounds vary from 6 to 10 ft. in height and up to 25 ft. in diameter and form veritable oases upon which the natives raise their choicest crops. These mounds also are hollowed out and serve the native coppersmiths as crude furnaces; their contents serve as prized building material. Not only do the natives profit by the industry of the ants but consider their bodies and those of the larvae as a great delicacy.

IDEAS FOR THE CONTRACTOR

Thoughtful Merchant Buys Light, Not Fixtures

Installation of the Nathan-Dohrmann Company, San Francisco, Result of Careful Planning to Obtain Best Utilization

By ROBERT G. DUMMEL, The Holophane Company

The store of the Nathan-Dohrmann Company, San Francisco, is an exceptionally fine example of the attractive results that can be achieved by careful planning and the application of specific equipment to obtain the best utilization of light under a particular condition.

The progressive merchant realizes that the problem today is not the production of light but the control of it, and that no one type of luminaire will give maximum results under all conditions. From the merchant's standpoint the acid test of good lighting is its selling power. Sales power results from a careful study of the kind of merchandise and the design of a lighting system that will show that merchandise at its natural best. Every merchant realizes that with no light he would sell no goods, yet, conversely, few seem to realize what a tremendous bearing good lighting has on sales. Careful study, attention to detail, and elimination of guesswork is typical of the successful merchant and this is true of the Nathan-Dohrmann Company.

The retail trade of this firm is devoted to art objects, china, silverware and household appliances. In addition to the general lighting, several unusual treatments were incorporated to show each particular class of material to its best advantage. The general illumination on the first and second floors is obtained with Holophane reflector-refractors on 11-ft. centers and giving a uniform value of 12 foot-candles. It was found by test that the prismatic type, in addition to its efficiency, appearance and low depreciation, showed no color distortion in bringing out the many brilliant colors on the china and glassware.

All fixture parts are finished in the same color as the ceiling, which is light caen stone. In each of the four central bays on the first floor is suspended a large ornamental, glass-paneled, lantern-type luminaire, as shown in Fig. 1. Within these luminaires are concealed 300-watt prismatic reflectors which direct a maximum amount of the light to the work, a combination of utilization and ornamental effect not often achieved.

A unique and attractive scheme is used to illuminate displays on glass shelves, backed by mirrors, along the east and west walls and around the columns. A wood overhang projecting 15 in. from the wall and 7 ft. high contains a concealed system of prismatic reflectors with 25-watt lamps on 15-in. centers. Below each reflector and flush with the underside of this cornice is a special prismatic condensing plate which intensifies the light in a very narrow downward angle, thereby confining the illumination to the display on the glass shelves and preventing wasteful spillover. One of these displays may be seen in Fig. 2. The effect is beautiful; color in a vase or bowl is brought out by light from the inside which appears to make it glow. There are fourteen columns and over 450 linear feet of wall space treated in this manner on two floors. Corners and areas, therefore, which are ordinarily unnoticed, are made to stand out and command attention solely through the remarkably attractive force of correctly applied light.

An interesting feature of the second floor is the fact that all daylight is excluded. The result is that the intensity and direction of the light on the display are at their best and constant at all times. Daylight always has been looked upon as the desirable thing and yet because of its continual variation in intensity and color it can be surpassed by the accurately planned electric lighting system.

The third floor, devoted to household ware and the retail offices, is illuminated by direct type prismatic enclosing units over the merchandise and by semi-indirect enclosing units (Filterlites) over the offices.

The entire fourth floor is occupied by the general offices and is illuminated by Filterlites throughout.

The fifth floor is taken up with an "as is" sales area, lunch room, mechanics' shop and similar departments. The lighting in each of these departments is designed to give maximum results by specific treatment.

The basement and sub-basement are devoted to stock, shipping and receiving. An interesting feature of the aisle lighting between stock bins and also the various corridors throughout the building is that a new type of asymmetrical-distributing corridor-type unit is used. The prismatic construction of this piece is such that most of the light is directed over the long di-

Fig. 1. Lantern-type luminaires in the central bays on the first floor of the Nathan-Dohrmann Company store. Each of four of these luminaires is equipped with 300-watt prismatic reflectors.

Fig. 2. All daylight is excluded from the second floor. Concealed units are installed in the overhang along the west wall. The overhead units providing general lighting also may be seen.

mension, giving uniform illumination at a spacing of three times the mounting height. This is to be contrasted with the case of bare lamps where uniform illumination is obtained at a spacing equivalent to the mounting height.

The show windows are lighted with an enclosing type 200-watt prismatic reflector. The condensing plate over the mouth of this reflector controls the light and prevents glare.

The service of the engineer did not end with the completion of the installation. A schedule of lamp renewals is laid out to insure proper relamping. A cleaning schedule also is determined so that, having efficient equipment to start with, the standard of service may be maintained constantly.

Progress in scientific illumination is making tremendous strides and the thoughtful merchant or manufacturer will buy, not fixtures, but **light.**

One of the eight show windows of the Nathan-Dohrmann Company store at Geary and Stockton Streets, San Francisco

Electrical Estimating for the Contractor — XIII

Applications of Silent Chain Drive for Motor Connection Many and Show Certain Advantages in Efficiency

By J. R. WILSON*, Quality Electric Company, Los Angeles

An estimator's knowledge of power-transmitting mediums would not be complete without a consideration of silent chain drive. There are a great many places where this form of drive is the only practicable method of connection between the prime mover and the driven machinery. A consideration of the claims made for this form of drive will suggest to the estimator many power transmission problems which may be solved therewith.

Some of the claims made for this form of drive are as follows:

1. It shows highest sustained efficiency of all mediums (98.2 per cent.)

2. It can be run at relatively high speeds, in either direction, and transmit any amount of power.

3. It can be used on short or long centers, giving a positive velocity ratio, and is not affected by heat, cold or moisture.

4. It reduces journal friction to a minimum, on account of being run slack, and the action remains perfect even after long use.

5. It cannot slip, and permits a high ratio of speed reduction in a single drive.

6. It operates quietly, and having more teeth in working contact (than spur gearing) results in smoother action and less wear.

7. While being positive in action, it also introduces the desirable element of elasticity thereby reducing the shock load danger.

8. In replacing direct connected set-ups standard speed motors may be used and mechanisms operated at most desirable rate.

9. As these drives can be operated at any angle, valuable floor space sometimes is saved by their adoption.

The general construction of the different makes of this form of chain is essentially the same. "Basically it consists of a series of leaves or plates, the joints being segmental, case-hardened liners or bushings and case-hardened steel pins." When used with the gears designed for this form of drive a complete unit of utmost efficiency, compactness and economy results.

An inspection of almost any plant, devoted to the manufacture of almost any product, will reveal one or more places in which silent chain drive would result in increased efficiency. Adoption of this drive also will eliminate many objectionable features of other forms of driving mechanism. To create a logical form of reasoning along this line, in the mind of the estimator, several examples of practicable application are given in this article.

Paint Mills

In the paint industry silent chain drive is used for driving line shafts, grinders, mixers, tinting mills, iron mills, roller mills, tandem and experimental mills. The service in paint mills is extremely severe and requires the positive contact, coupled with flexibility, offered only by silent chain drive.

Compressors

Silent chain drive has proved particularly successful in the driving of compressors. This is usually a heavy-duty, intermittent load service, offering a severe test to any form of drive. The usual practice is to use short center drives on compressors, and the chain drive meets this specification in a very practicable manner.

When ventilating fans are installed in connection with metal duct systems the transmission of noise through these ducts sometimes reaches a very objectionable degree. This is particularly true in theatres, schools, churches, office buildings, etc. To reduce this noise as far as possible the usual practice is to use large fans, run at very slow speeds. Silent chain drive permits the use of standard speed motors with minimum noise of operation.

Machine Tool Drives

The force transmitted by the chain is positive but elastic and is equal to the "instant demand" made upon it at any time during the machine's operation. The chain will deliver the required power continuously at the set speed and rate of feed desired, resulting in increased production, higher quality of products and saving of power. Carefully made tests between belt drive and silent chain have shown an average of 20 per cent greater output and 20 per cent saving of power in favor of chain drive.

To take each industry and cite the many advantages to be gained by the use of silent chain drive would require a great deal more space than can be given here. For the benefit of those who desire a general knowledge of the possibilities of this form of drive it may be well to mention a few of the many industries in which hundreds of these drives now are being used to advantage:

Rubber Mills—Line shafts, countershafts, strainers, devulcanizers, washers, mixers, cookers, calenders, presses, and tire trimmers.

Paper Mills—Beaters, washers, cookers, calenders, cutters, embossing machines, fans and jordans.

Cement Mills—Ball mills, tube mills, kominuters, conveyors, elevators, hoists, kilns, dryers and bag filling machines.

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Tanneries—Staking machines, wash wheels, rollers, glazing machines, extract drums, wringers, cheeking machines, hide reels, compressors, buffing machines, hair washers, rockers, unhairing machines, bark mills, brushes, fleshing machines, bleach hoists, fans, trimming machines, liquor pumps, conveyors, working out machines, deep well pumps and elevators.

Textile Machinery—Spinning frames, twisters, knitting machines, worsted draw frames, ribbers, sewing machines, cone winders, loopers, silk finishing machines, cotton weave looms, extractors, picking machines, tape or binding looms, blowers and hosiery presses.

Candy Factories—Mixers, pullers, beaters, mills, enrobers, conges, continuous cookers, longitudinals, melanguers, starch machines, dryers, cutters, plastic machines, rolls, pulverizers and roasters.

An inspection of the above list will reveal many tyes of machines used in industries other than those mentioned. Potteries, steel mills, woodworking plants, printing machinery, grain and flour mills, and other industrial plants all offer opportunities to the estimator who is interested in giving his clients the highest type of installation. The first cost of silent chain drive against belt or gear drive may or may not prove to be higher. But the longer life and lessened upkeep cost should be the determining factor in an estimator's recommendation.

Each job should be engineered carefully, and all factors carefully weighed. First cost is not always the prime consideration in making an industrial installation. Permanent satisfaction to both the customer and the estimator can be realized only by taking into account the factors of upkeep and flexibility of future expansion. "First cost" should be really the last consideration.

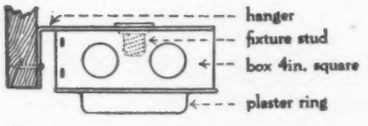
The question of what type and make of silent chain drive to recommend is regulated by the particular machine and duty it is expected to do. There are several manufacturers of this type of drive, and it is not within the scope of this article to consider the merits of each make. Each maker issues literature covering the design and claims made for his product.

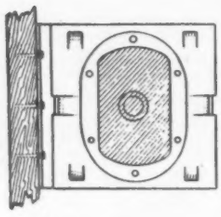
It would not be practicable in such a limited space to give the tables and data pertaining to the use of silent chain drive, as the subject is very large. By applying to the local agent the estimator will receive the unlimited co-operation of the agent and such data as he may need.

The writer wishes to recommend the following Link-Belt Company booklets for perusal and study by those estimators who are interested in acquiring authentic information pertaining to this form of drive.

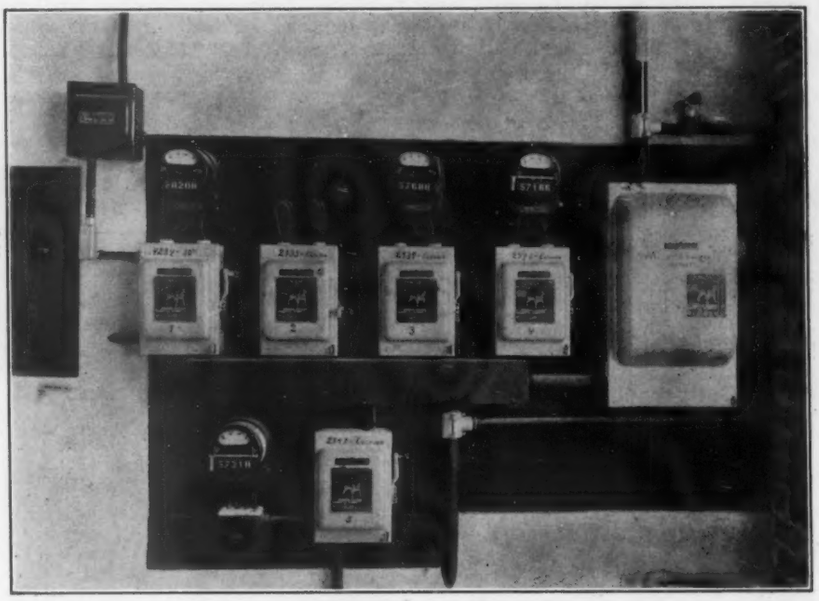
		No.			
Data	Book	125—	General	Information.	
"	"	299—	Drives	for	Rubber Mills.
"	"	424—	"	"	Paper Mills.
"	"	345—	"	"	Cement Mills.
"	"	309—	"	"	Grain Elevators.
"	"	310—	"	"	Clay Working Machinery.
"	"	312—	"	"	Machine Tools.
"	"	383—	"	"	Tanneries.
"	"	426—	"	"	Shoe Machinery.
"	"	425—	"	"	Textile Machinery.
"	"	543—	"	"	Textile Machinery.
"	"	430—	"	"	Sewing Machines.

This and other companies' engineers will be pleased to furnish information to meet any particular conditions requiring them. The writer would be pleased to list the booklets of other manufacturers if such information were at hand.





Universal outlet box which may be used for a ceiling, bracket, switch, or convenience outlet. It is installed by putting three nails or screws into the stud and then putting the box itself into place. The box is manufactured by the Peccop Manufacturing Company of Los Angeles.



Main switchboard installed in Beck's garage in San Diego, Calif. Note the method of making an effective ground using a clamp bolted to the conduit. Connection to the water pipe is made using a smaller size conduit.

Time Saved in Assembly by Use of New Ground Clamp

Considerable time may be saved by contractors by using a new ground clamp patented by R. A. Schmitt of San Diego, Calif. The clamps are threaded fittings designed to make an effective bond between conduit and piping systems.

The cast-iron part is made with a blind hub and is tapped for standard pipe or conduit. This part also is designed to serve as half of a bolted clamp, the other half of which is made of sheet steel stamped to fit the outside of standard pipe or conduit. The two parts are assembled with brass machine screws and nuts. The iron and steel parts are electrogalvanized as a protection against corrosion.

The clamp allows for contraction and expansion and eliminates the use of a copper wire to a water pipe in making service grounds. It provides a rigid ground throughout and does away with the danger of mechanical injury. In addition to being bolted to the conduit, two sets of screws seated in the conduit provide added ground connection.

Frequently corrosion will set in between copper and iron in an ordinary installation. This condition is done away with. In addition to the time saved in general assembly, the time consumed in sweating the copper wire to the ordinary ground clamp is saved.

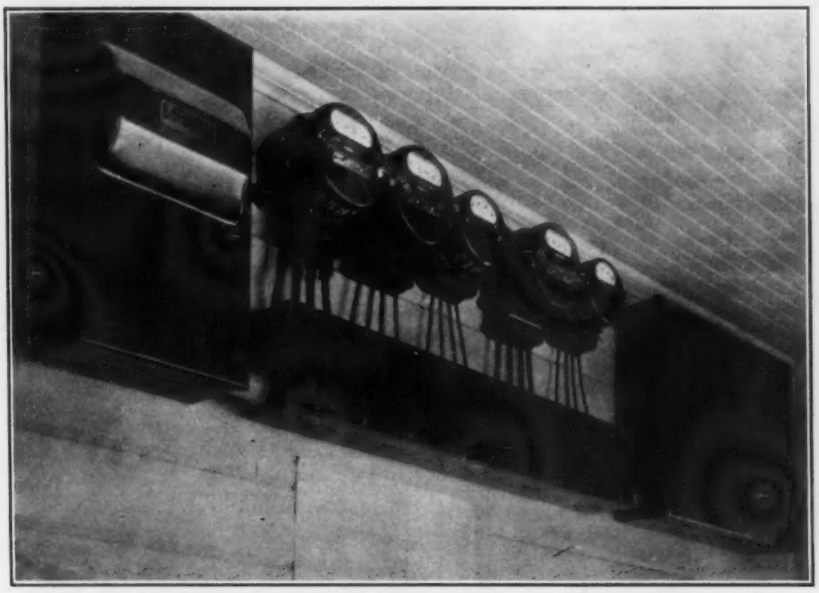
Attractive store of the Radio Electric Shop, Sonoma, Calif. A. J. Martinson, the proprietor, is an electragist.

Contractor Installs Individual Meters in Own Home

Segregated figures covering the cost of operation of an electric range, water heater, air heaters and lights in the home are usually impossible to obtain accurately, as only one meter is installed.

This problem has been solved satisfactorily in his own home by Tully N. Cornick of the Cornick Electric Company, Petaluma, Calif., by installing a master meter, which records the total amount of current consumed, and individual meters for the range, the water heater, air heaters and lighting. In this way the amount of current consumed by each of these appliances is obtained. The meter readings of each are placed on a chart just below the meters.

Mr. Cornick has obtained some valuable figures for use in selling ranges and water heaters. When prospects ask about the cost of operation of these devices he can give them actual cost figures in his home. This gives the customer a definite basis on which an intelligent estimate may be made as to what it may cost in his particular case.



Master meter and individual meters for range, water heater, air heaters and lighting installed in the home of Tully N. Cornick, an electrical contractor in Petaluma, Calif. In this way the amount of current consumed by each of these devices is obtained.

A. W. Grimmenstein of Redwood City, Calif., prepared this attractive radio and appliance window display. Note the use of the Electragist symbol on the window.

Industry Joint Conference to Study Trend of Wiring

Representatives of the four principal branches of the electrical industry are being organized as a fact-finding body to make a thorough study of the trend of wiring. This body will investigate the cost of wiring and the influence of various wiring methods on the progress and adequacy of wiring installations, with particular reference to house-wiring.

Advocates of all metal construction, knob and tube work, and non-metallic sheathed cable long have been in controversy over the effects of the different systems on the sale of house-wiring and therefore on the expansion of the market for electrical equipment and appliances.

The Association of Electragists and the wiring committee of the National Electric Light Association jointly have invited Earl E. Whitehorne, commercial editor of Electrical World, to call together representatives from the four associations of the electric power companies, contractor-dealers, manufacturers and jobbers to develop the needed facts on which the industry may base intelligent opinion. The Electrical Manufacturers Council and the Electrical Supply Jobbers Association have agreed to support such a market study.

The general lines along which this joint conference may be expected to direct its survey may be indicated by the following ten questions which are to be considered:

1. What is the present trend in the cost of wiring?
2. Is the present cost of wiring retarding the installation of electric lighting and appliances or restricting the adequacy of installations?
3. What is the present trend in the adequacy of wiring?
4. What influences today are encouraging or restricting the adequacy of wiring installations?
5. What is the influence on the progress of house-wiring of different systems of electrical construction required by municipal regulations within a community, such as a "rigid conduit only" and the "all metal standard?" Is a larger percentage of houses being wired, or are wiring installations more adequate where "knob and tube work" is common or where non-metallic sheath cable has been used extensively?
6. Is excessive cost of wiring, if and where found today, chargeable to over-expensive material or to an abnormal scale of wages for labor, or to restrictions on the output of labor?
7. Are present wiring methods wasteful and does the cause appear to be super-standards of quality in wiring materials and equipment, or lack of training and skill in workmanship?
8. If buildings, old and new, are not being wired in sufficient number or adequately wired, how often is the restraining influence the higher cost of electric current?
9. Is the progress of house-wiring being held back to any extent by over-restrictive policies on the part of the central station in regard to extensions or capacity or readiness to serve?
10. Is slow progress in the wiring of houses and the inadequacy of installations commonly chargeable to lack of co-operation between the contractors and the central stations, and who is most responsible?

BETTER MERCHANDISING

The Washing Machine---A Self-Starter

Experience Proves That the Washer Starts the Household in the Use of Other Electrical Appliances

Washing Machines—Who Will Buy? Is the Question Asked

Who will buy washing machines? Is the saturation point at hand, or is there a saturation point, any more than there seems to be a saturation point in automobile sales?

A few years ago the wise heads of the automobile industry had a headache, individually and collectively. What to do with the so-called saturation point, that was the question. Time rolled on, regardless of the worry of those who do such things as worry, and the theoretical saturation point was reached and nothing happened. All the breath-holding had been sheer loss of air.

There just wasn't any saturation point to the public's desire for better and more cars. True enough, there were used cars by the lot-full wherever there were vacant lots. But, aside from tobogganning the prices of some of these temporarily, nothing happened to the market.

As long as better cars were being made there were people hungry for them and ready to give away the old buggy to get one. So it came to pass that those who hitherto had walked bought the discarded cars at a price they could afford to pay and became, in turn, good prospects for next year's new straight nine with interlocking cylinders and improved swaffle valves on the main vimbraces.

So with the washing machine! There will be no saturation point in washing-machine sales so long as up-to-date manufacturers improve models, as long as there is washing to be done in the home, as long as terms are easy and service good, or as long as machines are available to every housewife. The new machine will be for the more prosperous and the rebuilt or second-hand machine for the less prosperous but no less anxious housewife who probably needs it most.

There is a market for rebuilt washers, even as there is a market for rebuilt cars, typewriters, adding machines, and California bungalows. Good salesmanship sells them all, and still more cars, typewriters, adding machines and California bungalows are turned out each year.

Why Sell Washers?

Washing machines are among the favored three appliances—the iron, the vacuum cleaner and the washer.

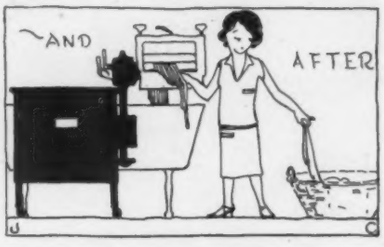
As a load-builder the washing machine is a good beginner. By itself it uses little electricity, it is true, but its running mate is the iron, and it creates a demand for the ironer, which IS a good load builder.

The washing machine is the entering wedge to make the home electrical. If it is a good washing machine it requires very little servicing or care. It brings the message of electrical convenience. It creates a desire for more of the same sort of medicine—more electrical convenience. It is a good-will builder and an appliance sales builder.

Who should sell the washing machine? The drug store? Hardly. The electrical merchandiser, certainly. The central station should sell it. The electrical dealer should sell it. The specialty shop WILL sell it, and if the electrical men do not handle the washing machine the non-electrical merchandiser, the department store, hardware store, household furnisher, and even the drug store will sell it—and make money selling it, for they would not sell them if there wasn't money in them.

One central station, as related in these pages, has sold over a thousand each year for several years, and most of those each March. It pays that company. Other pungent thoughts pertaining to washing-machine selling is contained in this Better Merchandising Section. There may be some idea here which has never occurred to you, some that you have forgotten.

READ ON AND PERHAPS PROFIT.



In the following brief stories he who cares may read of prospects where no one thought prospects grew, of applications of washing machines to which the indifferent merchandiser has not given thought. They present some sales ideas usable by anyone selling washing machines. They uncover possibilities perhaps well enough known to the experienced specialty salesman who overlooks no opportunity to make a sale but which the electrical fraternity has not yet utilized.

They are light reading, and all are "true confessions." Moreover, the artist has spotted the highlights in a number of accompanying little sketches so that they cannot be missed. Read on—

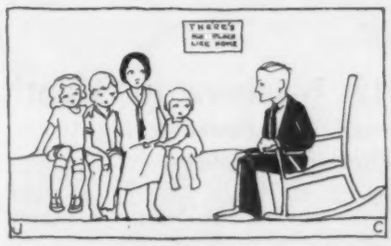
Left a Widow, a Washing Machine Provides Her Livelihood

In the state of Pennsylvania there lived a man, his wife and their three children. Then came the influenza epidemic; the husband and father contracted the disease and in three days he was dead. When the estate was settled the widow was left with a one hundred dollar equity in the little home for which they had been struggling to pay. She was a woman with no special training in earning a living. She desired very much to keep her little family together and to look after her children herself, but there seemed to be no way of doing this except by taking in washing.

Her plight came to the attention of an electric washing-machine salesman. He called upon her and suggested that she buy an electric washing machine. At first the idea of going into debt for more than a hundred dollars when she so much needed every penny she could get did not appeal to her.

However, the salesman presented the proposition as an investment that would set her up in a little business. She could conduct it in her own home and the washing machine would enable her to earn much more than she could if she attempted to do all the washing

she took in by hand. In the end, after terms of payment had been arranged making it possible for her to meet them, she did make the purchase. The machine relieved her of the hardest work of washing; it made it possible



The salesman showed her that she could earn twice as much with the electric washer and would save her strength for her home and children.

for her to finish the washing more quickly and to take in more. She has been able to support her little family and to do it without leaving her home. That woman is convinced that an electric washing machine is a good investment.

"Old Machines for New" Are Bound to Boost Washer Sales

Those people who now own washing machines are excellent prospects for something a little more recent or a little better. If they can be persuaded to trade-in the machines they have and buy a brand-new machine, then those trade-ins actually can be rebuilt at a small expense just as typewriters and cash registers are rebuilt, and the rebuilt machines can be sold at a fraction of the original cost although they are in a condition such that they will render several years of good service. In this manner the washing-machine field can be expanded very greatly. Those who have bought used machines, in a good proportion of the cases, will buy new ones later on.

It has been found in the automobile business that used cars very greatly have increased the sale of new ones. People who otherwise would not buy a car at all buy a new one because all the neighbors have cars. Every other car in the vicinity may be a used car but this type of person is too proud to drive a machine that has been discarded by someone else, so he spends the money and buys a new one.

In the automobile industry the used-car business has been effectively instrumental in building up the market for automobiles. People who now own cars are encouraged to trade them in and get something better. Those who do not own cars are encouraged to buy a used one rather than get along without a car at all. Easy terms and reasonable guarantees are given with the used cars.

When we start making comparisons between the automobile industry and the washing-machine industry we are likely to hear some excuses from the man who sells washing machines.

There are various reasons why there has been such a great difference in the sales of washing machines and of automobiles. The difference in the number of prospects does not enter into the proposition, however. What does, is the difference in the methods of selling. It has been actually harder for the average person to buy an electric washing machine than it is to buy an automobile.

Make it easy enough for people to buy and consider every family in the United States as a prospect and there is no reason why there should not be a greater number of washing machines in use than there are automobiles. The average investment in a washing machine is considerably less than the average investment one must make in an automobile. In addition, the automobile will wear out in five or six years if it is used regularly. The washing machine is a very much simpler piece of mechanism than the automobile. This greatly simplifies the problem of dealing in used machines. The washer can be given a complete overhauling, it even can be fitted with a brand-new motor and still keep the total cost of rebuilding down to the labor cost alone of giving an automobile as thorough an overhauling. Every-

"Lady, we'll take your old haywire model in on the first payment for this magnificently superb super-washer."

thing is in favor of the washing machine. The problem then simmers down to one of making it as easy to buy and placing the washing machine within the reach of as many people as is the automobile. This means that every person should be considered a prospect even after a washing machine actually has been purchased.

Two Girls Decide to Go Into Business for Themselves

A couple of girls decided that they wanted to go into business for themselves. They bought an electric washing machine and an ironer and started a little home laundry. In the course of a few years they were able to build up a profitable little business. The electric domestic laundry machines on the market made this possible.

These two incidents show the folly of attempting to draw the lines between people who are prospects and who are not prospects for washing machines, or for other electrical appliances for that matter. If new uses can be found for these appliances, the

Who would have thought that Mary and Maud, two young girls, would buy a washer, and yet because they wanted a business of their own, they bought one and started a hand laundry.

market is extended automatically. Here we found a woman with no money and no sure income who bought an electric washing machine in order to make it possible for her to earn a living. If only those people with sufficient in-

"Why, Mum, they's not many houses these days that don't have an electric washer, and I for one ain't anxious to work where they ain't none."

come to pay for a washing machine had been considered as prospects, it is quite evident no sale would have been made to her. In the other case the sale was made to a couple of unmarried girls.

The sale of washing machines appears to depend more upon the attitude the salesman takes than upon the income of the people to whom he attempts to sell.

Servants Demanded a Washing Machine and an Ironer

A woman in one of our western cities received the shock of her life not long ago. She is a woman who always had someone come in to do the washing and ironing and general housework. But she lost her faithful servant of many years, and when the applicants came to answer her advertisement for help they gave her the surprise of her married life. Each applicant for the job asked her if she had an electric washing machine, and most of them quit or did not even start to work for her when she revealed that hers was a household as yet unmodernized.

Get enough washing machines introduced and a condition sooner or later will arise which will force sales. Let all the washerwomen and servants begin to demand washing machines and people simply will have to buy them if they are going to retain any washerwomen and servants.

Again, get a few women who take in washing, that is, do all the washing at their own homes, to buy washing machines, and the competition these women offer will force other women who take in washing to buy washing machines. If these women are so situated that they cannot possibly buy new machines and there are used machines on the market, then they will buy used machines, but since they are using them steadily, it won't be many years before they have worn them out and they will have to buy new ones.

Motion Pictures Used as Sales Promotion for Washer

A picture in which the story is built around an electric washing machine has been prepared by the Universal Pictures Corporation in co-operation with the Gainaday Electric Company and is being made available to dealers in that company's washer as sales promotion material.

"Little Giant," as the picture is called, features Glenn Hunter. The story deals with the tribulations of a young washing-machine salesman who must make good to win the girl of his choice and is said to contain much humor and an interesting plot. In the picture the young man has an opportunity to sell the machine to a prospect, and in this manner the sales message is put before the movie audience.

Poster which ties in the motion picture with the dealer of washing machines in his advertising efforts. This motion picture has been prepared by a nationally known producer in conjunction with the manufacturer of washing machines, and is designed for dealer tie-in with his local motion picture theater.

Advertising material, contests, and other promotion material have been worked out to complete the tie-in between the dealer and the picture house. The plan has been used in many localities and is said to be productive of unusually fine results.

Specials to Come Cast Their Shadows Before

In the columns of this Better Merchandising Section of the Journal of Electricity special treatment is to be given in forthcoming issues to a number of live merchandising problems. If you have ideas upon them, they will be as the breath of heaven—send them in by all means. Each of the following subjects will be considered carefully and searchingly:

1. The Trade-in or Used Appliance Problem—How successful merchandisers deal with it.
2. Training Appliance Salesmen—Some of the best methods.
3. The Electrical Dealer's Advertising—How much, when, and where he should place it.

Special sections will be devoted to the selling of small appliances, lamps and lighting, air heating, ranges, ironers and irons, and Christmas sales plans. Watch for them.

Electric Washers and the Servant Problem.—That servants cannot use electric washing machines is often given by housewives as a reason for refusing to buy a machine. In this respect it is interesting to note what Mary Armsbee Whitton, in a recent number of Woman's Home Companion, has to say on the subject:

One of the modern housekeeping fallacies most frequently encountered, she writes, is the theory that electric household machinery is something that can be appreciated only by the intelligentsia, and that its operation is clearly beyond the comprehension of the ordinary hired household assistant.

This point of view sounds discriminating and judicious but is entirely contrary to a fairly active, practical experience extending over a period of more than ten years. During this time I have yet failed to discover the domestic service worker who was too ignorant, or too obstinate, to be taught the use of all the regulation electric household devices, or who, having once been taught, did not give better service with machines than she could by using her old by-hand methods. Nor should it be assumed that my experience is in any way unusual, or that I have been dealing with a specialized and highly trained type of helper.

Central Station Sells 1,012 Washers in Month

Annual Washing-Machine Sale of Utah Power & Light Repeats Triumphs of Former Campaigns

The Utah Power & Light Company's annual washing-machine campaign, conducted during March, 1926, again proved to be one of the outstanding events of the year in the electrical industry. This company again set a quota of 1,000 machines and exceeded this quota, as has been done in every similar campaign which it has conducted for the past twelve years.

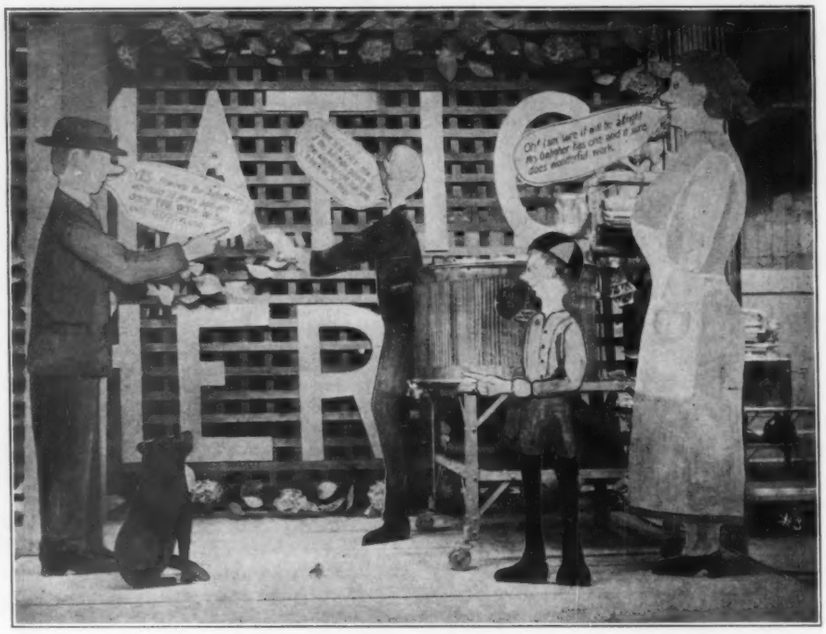
The total reached during the campaign of March, 1926, was 1,012 machines. This figure, while not as high as in some previous campaigns, is remarkable in view of the fact that a greater degree of saturation is reached each year and that in addition the company's sales organization is confronted with much more competition each year.

Generally speaking, the March, 1926, campaign was conducted along lines similar to those of the past. The most important new feature introduced, and one which brought very good results, was the participation of a goodly number of the company's employees in the selling activities, in addition to its regular sales organization. Prior to the campaign a circular letter and broadside were distributed to each employee, outlining an attractive offer, consisting of liberal commissions based on the number of machines sold by them. The company's house organ, "The Synchronizer," also carried a full explanation of the plan and an editorial urging employees to participate. Approximately 400 machines were sold by such employees, about 125 taking part in the campaign.

The famous slogan, "A Copper Washer for a Silver Dollar," again was adopted as the keynote for the sixth successive time, and once more proved to be a very effective method of attracting attention to the company's great annual event. This slogan has become identified so completely with this particular activity in the minds of the public that its value seems to increase each year.

Newspaper display advertising was used to considerable extent, as heretofore, in addition to direct-by-mail broadsides, billboards, window displays and special "stunt" features.

A series of "peppy" sales letters, featuring aeroplane altitude flights, was prepared, a letter each day being sent to division managers and sales people. Each of the company's ten divisions was assigned a mythical aeroplane, with an appropriate name, and the total of washing machines sold each day in all divisions represented the altitude reached for that day, 10 ft. being allowed for each machine sold. Relative standing in the race was determined in accordance with the percentage of quota reached by each division each day.



Andy Gump, the famous cartoon character, was enlisted, by means of cut-out figures, in window displays during last year's washing-machine sale of the Utah Power & Light Company. An entire series of these cartoon windows was used, showing Andy in varying stages of being sold a washing machine.

The usual terms of $1 down and $5 per month which have prevailed in a number of previous washer campaigns conducted by this company were again in effect.

In previous campaigns the use of banners displaying the slogan was adopted. Company automobiles carried these banners on their trips to all parts of the various towns, and the city street cars also carried the message in the form of large banners on each end.

The small boy did his part by wearing a skull cap bearing the slogan.

Starting the campaign was a sales breakfast, given the sales staff just before the zero hour. A few minutes following this scene this same staff went over the top upon this year's campaign.

Several thousand of these caps were distributed to the enthusiastic youngsters.

Direct-by-mail advertising was used last year in distributing to all of the company's customers the "Automatic Oracle," a novelty designed in such a way that the customer could ask a number of questions regarding the automatic washer, and by means of a magnetized dial and pointer receive the answer. The backs of billing envelopes also were used to carry a message regarding the campaign.

With total sales of 1,265 machines for the month, the Utah Power & Light Company established for its March washing-machine campaign last year the second highest figure in the company's history. This figure was exceeded only in March, 1920, when 1,711 machines were sold. This company's remarkable success in its annual washing-machine campaigns is attracting the attention of the entire country, and that year was no exception. In the face of a fairly high percentage of saturation in some districts and unusually keen competition, the selling of 1,265 machines at retail by the power company, which is undoubtedly a much greater number than has been sold by any other concern in one month in the entire country, is a striking example of results obtained by intensive sales efforts.

Few, if any, merchandising events of any description arouse the enthusiasm and interest of a sales organization to as great an extent as does this annual event on the program of the Utah Power & Light Company. Not only does this spirit prevail among the sales people, but almost the entire personnel partakes of it.

In the Salt Lake division this year a novel feature was the opening of the drive with a breakfast bright and early Monday morning, March 1. The members of the sales force of this division, together with a number of officials, were guests of the company on this occasion. Enthusiasm ran high, and a good start thus was obtained.

Keen interest was maintained throughout the company's entire organization during the entire period of the campaign, and the public at large

A billboard telling of the annual washing-machine sale of the Utah Power & Light Company.

seemed once more to grasp the "copper washer for a silver dollar" idea in a most gratifying manner.

Courtesy Card Brings Back Customers.—A touch of courtesy makes the whole world pleasanter. One progressive merchant not long ago conceived an idea that the individual courtesy of his clerks could be enhanced and the customer made to feel a personal interest in the store and in the clerk by the use of a card. The card was given to the customer or wrapped up in his bundle of merchandise purchased. In text it was as follows:

MR. A. R. SMITH
Served You

In charge of	Will Be Pleased
Radio Department	To Serve
J. Q. Jones Electric	You
Company	Again

Your opportunity to own an AutoMatic Electric WASHER
$1 DOWN
$5 A MONTH
ends on the stroke of 6 tomorrow night
Automatic SHATTERING ALL RECORDS
Such popularity must be deserved!
This Is Unbeatable Proof of Popularity
$135.00
$1 DOWN
$5 A Month
UTAH POWER & LIGHT CO.
Again A Copper Washer for A Silver Dollar
Our Great Annual Event!
$ down
During March Only
There are more AutoMatics in service in this territory than of all other makes combined
On Monday we begin our FOURTEENTH ANNUAL SALE of the MARVELOUS
AutoMatic Washer
REMEMBER: Back of every washer we sell is our guarantee and our well known service
UTAH POWER & LIGHT CO.
BUY YOUR AUTOMATIC NOW
The Last Three Days of Your Golden Opportunity
1926 MARCH 1926
AutoMatic Electric WASHER
$135 ON TERMS
$121.80 CASH PRICE
THE WORLD'S GREATEST VALUE IN WASHING MACHINES
$1 Down
$5 A MONTH
UTAH POWER & LIGHT CO.

Some of the effective newspaper advertisements which brought results in the annual washing-machine sale of the Utah Power & Light Company, both in this year's and last year's campaigns. During the past thirteen years, one advertisement states, the company sold 19,257 washers. This sale has become an annual event in the territory served by the company.

NEWS OF THE INDUSTRY

Commissioners on Uniform State Laws Favor Indeterminate Permits for Utilities

A long step forward toward national unification of public utility legislation, especially as it pertains to franchises, was taken in Denver recently during the annual meeting of the National Commissioners on Uniform State Laws when the commissioners went on record in favor of "indeterminate permits" for public utilities. So far as the utility industry is concerned, the action was the most important taken during the session. It was of especial interest in Colorado where much confusion has existed for years because of a conflict in state laws growing out of the constitutional provision for "home rule" cities, in which public service organizations are under local instead of state commission regulation.

Action on the "indeterminate permit" idea in public utility legislation, designed to eliminate the present system of giving franchises for a fixed number of years and to authorize utilities to operate permanently under conditional permits issued by state public utilities commissions, came up during consideration of a proposed uniform utility act. While lack of time prevented final consideration or approval of the entire act at this year's conference, the commissioners definitely voted in favor of the permit plan and instructed the committee in charge to use this as a basis for its act in presenting it again for final action next year.

The act as a whole aims at uniformity in regulation of public utilities in all their relations with the public.

The "indeterminate permit" feature would continue franchises once granted until such time as the holder failed to fulfill its obligations properly or until its properties were purchased by the municipality affected.

Commissioners F. E. Curley of Arizona and Dix H. Rowland of Washington were the leading proponents of the measure, which occasioned considerable division among those voting.

"It is the only fair way to handle the matter," said Commissioner Rowland. "A public utility ought not to be required to junk its plant and cease operations when its franchise expires. When the utility has put its funds into the business, why shouldn't it be permitted to continue to operate or, as an alternative, the city required to buy it out?"

Opposition to the measure was headed by Judge James F. Ailshie of Idaho who said:

"To my mind it's a dangerous innovation. It amounts, in effect, to a permanent franchise. The constitutions of many of the states forbid it and it is a principle which ought not to be adopted. It has been the principle for years that there ought to be a limit on such things." He contended that the only method of ending or terminating such franchises would involve purchase of the utility by the city in which it operated. It also was argued by opponents of the act that it would tend to create municipal ownership of utilities.

Proponents of the provision asserted that it was necessary to protect investors in public utilities securities and also to insure cities continued efficient service.

The purpose of the uniform utilities act as a whole is defined in its introduction:

"Our larger utilities are no longer merely local plants. They probably cross at least one state line and possibly two or more. Uniformity of regulation in the several states served by any one utility will inevitably be reflected in decreased operating costs, improved service and probably either increased dividends for stockholders or decreased charges for consumers, or both.

"Furthermore, state regulation of the public services has become an established institution which is destined to develop in scope during the next several decades. The development will follow the present gradual increase in the number and extent of public utilities and the growing importance of their position in our economic and social structure. The state regulatory acts have now been in existence a sufficient time for there to be a considerable volume of court decisions construing them. The public is awakening to the principles which must govern regulation."

Duties and regulations imposed upon utilities by the provisions of the act include the following:

All rates must be just and reasonable.

Every utility shall furnish adequate, efficient and reasonable service.

Every utility shall file a schedule of rates with its state utilities commission.

No utility shall depart from the schedule.

No utility shall grant unreasonable preferences, or maintain unreasonable differences, in rates or service between localities or classes of service.

No change in rates shall be made except on thirty days' notice to the commission.

No new construction or extension of service, with certain exceptions, shall be entered upon without a certificate of convenience and necessity first being obtained from the commission.

Los Angeles to Vote on Bond Issues of $21,000,000

Bond issues totaling $21,000,000 for the use of the city's water and power departments will be submitted to the voters of the city of Los Angeles at the Aug. 31 primary election. Of this total $11,000,000 is for the power department and $10,000,000 for additional water and water-distributing facilities.

E. F. Scattergood, chief electrical engineer for the Bureau of Power and Light, in explaining the purposes for which the funds from the power bonds would be issued, outlined three major expansion programs which are called for at the present time. These programs are:

1. Development of 28,000 hp. additional hydroelectric energy along the Owens River aqueduct.

2. Acquisition of rights-of-way and the construction of tower lines and two new electric stations as a part of a high-voltage transmission system which ultimately will encircle the city.

3. Purchase of privately owned electric distribution lines in recently annexed districts.

Mr. Scattergood also mentioned the fact that independent of this bond issue a standby steam plant of 33,000 hp. capacity is to be constructed by the Bureau immediately upon receipt of materials and equipment.

The Southern California Edison Company has requested that the city of Los Angeles be enjoined from building this proposed steam plant, contending that the city in so doing is acting in violation of the contract now existing between the city and the Southern California Edison Company. (Journal of Electricity, July 1, 1926, p. 28.)

Of the $11,000,000 for the power department, the larger items cover additional water storage, $1,500,000; completing generating plant No. 1, $1,250,000; rights-of-way for new high-voltage line, $3,700,000; acquisition of new lines, $2,000,000; other items include additional equipment and facilities for the distribution system.

In the water department $6,000,000 of the $10,000,000 is to be used for the purchase of additional water-bearing lands in the Owens Valley in the vicinity of West Bishop and Round Valley. The additional land to be secured by this purchase, it is stated, will give the city complete ownership of 90 per cent of all water-bearing land in the valley and is expected to mark the end of the feud between the city and the Owens Valley ranchers. The remainder of the fund required for the water department is for new mains, trunk lines, storage facilities, etc., for this year and next year.

Outside Services of City Plant Subject to Commission

An important decision on public-utilities matters was rendered recently by the Supreme Court of Colorado when it handed down a decision to the effect that when a city owning a public utility goes outside its own boundaries and provides service for suburbs, other towns or cities, or merely private individuals, the public utilities commission has the same power over those outside services that it has over a private corporation.

The decision was rendered in a case which has been in litigation for about three years between the city of Lamar and the town of Wiley, Colo. At that time the light and power company that, under private ownership, was serving Lamar was purchased by that city. While privately owned the power company had made a 20-year contract also to serve Wiley, which used the power for pumping in its municipal water system. After the purchase the city raised the rates for service to Wiley, and the town brought suit in the district court of Prowers County to force Lamar to recognize the contract it had assumed when buying the power plant from the private corporation. The case was decided in favor of Wiley, and Lamar appealed to the Supreme Court.

That court decided, in an opinion by Justice John Campbell, that when Lamar sold power to a neighboring town it was acting just as would a private corporation, and the public utilities commission would have jurisdiction. The commission has no jurisdiction over the rates charged to citizens of Lamar, because these citizens are, in the last sense, the rate-making power themselves, since they have the power to elect and remove municipal officers who make the rates. But since the citizens of Wiley have no voice in the choice of Lamar city officials, the public utilities commission, as an agency to enforce justice between public interest, has the power of rate control.

For this reason and because the city of Lamar satisfied the public utilities laws in filing with the commission its schedule of rates, and because at that time the town of Wiley made no protest, the contract is not binding upon Lamar, the high court held. However, Wiley at any time can file before the public utilities commission a complaint against the rates, and, after a hearing, the commission can readjust the rates.

Steel Works Electrification Nearly Completed

The new $1,500,000 electrification project for the steel works of the Colorado Fuel & Iron Company, Pueblo, is just about completed, and indications are that preliminary tryouts on the power house will be made soon, according to information received from officials of the company. The change from steam to motor drive will take place gradually with the minimum of interruption, and it is estimated that by fall the complete change will have been made.

With but one exception, that of the reversing blooming mills, every rolling mill and the rail mills are undergoing electrification, and it is said that this is the biggest application of electric drive to steel-mill work west of the Mississippi River.

The plant, which has a capacity of approximately 40,000 hp., is considered one of the most modern in any steel works in the country. Engineering was done by Wilfred Sykes, consulting engineer of Chicago, and the entire electrical equipment is being furnished and installed by the General Electric Company.

New 85,000-hp. Unit Completed at Long Beach Steam Plant

Completion of unit No. 9 of its Long Beach steam plant has been announced by the Southern California Edison Company, Los Angeles. This, the third large unit to be constructed at Long Beach in less than two and one-half years, is to have a maximum capacity of 85,000 hp., which will bring the total capacity of the plant to 305,000 hp. and make it the largest steam generating plant west of the Mississippi River.

The turbine was built by the General Electric Company and the condenser was furnished by the Westinghouse Electric & Manufacturing Company. Connelly boilers were installed. Power is generated at 13,800 volts and stepped up to 60,000 volts. The turbine was built to operate at 400 lb. pressure and 725 deg. temperature. The seven boilers are equipped with Bailey water-cooled furnace walls to prevent heat loss due to radiation. Economizers and air preheaters have been installed to reclaim heat ordinarily lost in the flue gases. Burners capable of using either gas or oil for fuel were installed.

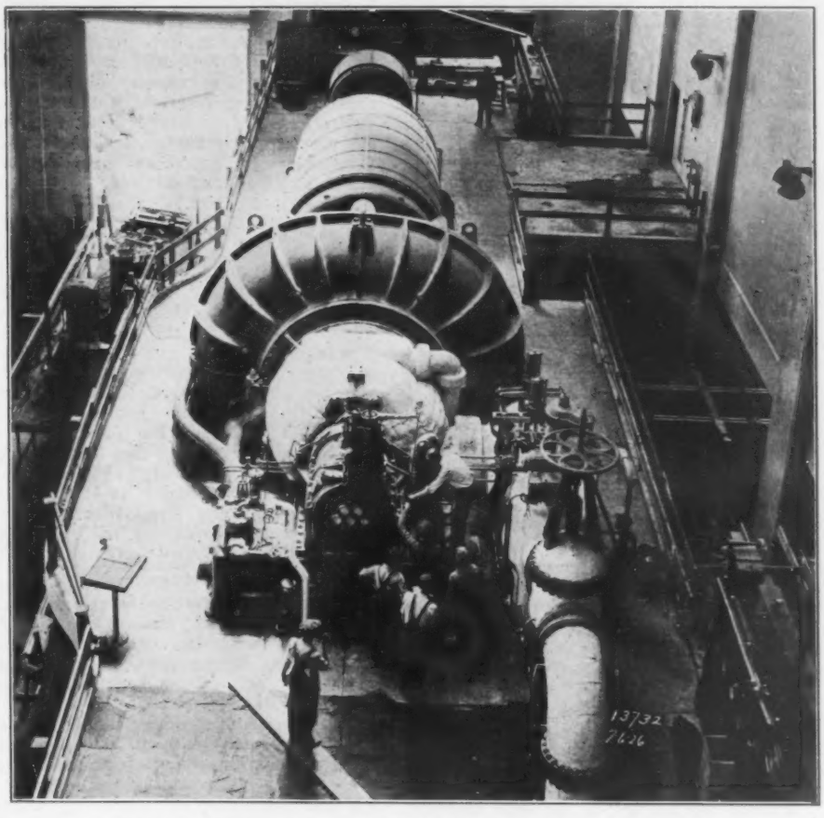
Stone & Webster, Inc., acted as engineers on the project and in completing the work in less than eleven months created a new record for speed and efficiency. The total cost has been set at $5,500,000.

World Power Sectional Meeting at Basle Aug. 31-Sept. 12

The technical program of the sectional meeting of the World Power Conference, to be held at Basle, Switzerland, Aug. 31-Sept. 12, will deal with five main subjects. These are: Utilization of Water Power, and Inland Navigation; Exchange of Electrical Energy Between Countries; The Economic Relation Between Electrical Energy Produced Hydraulically and Electrical Energy Produced Thermally —Conditions Under which the Two Systems Can Work Together with Advantage; Electricity in Agriculture; Railway Electrification.

Of the paper contributed by the American group, the first three subjects listed above will be covered by Col. Hugh L. Cooper; Col. William Kelly, director of engineering for the National Electric Light Association; W. E. Mitchell, vice-president, Alabama Power Company, and John M. Gallalee, of the University of Alabama. Dr. E. A. White, director, Committee on the Relation of Electricity to Agriculture, has prepared a paper on "Electricity in Agriculture," W. S. Murray one on "Railway Electrification," and N. C. Grover and John C. Hoyt have collaborated on "National Aspects of the Study of Water Reserves."

O. C. Merrill, executive secretary, Federal Power Commission, is chairman of the American group. John W. Leib, vice-president, and general manager, New York Edison Company, has been chosen to preside at the Sept. 6 session, in accordance with the request of the Swiss committee which requested the American group to select the presiding officer for that date.



The new 85,000-hp. turbine recently installed in the Southern California Edison Company's Long Beach steam plant.

Suit Filed in Protest Against East Bay District Permit

Based on the assertion that the water supply of the San Joaquin watershed is inadequate to care for its own needs, suit has been filed in the superior court of Amador County, Calif., against the East Bay Municipal Utility District, Paul Bailey, acting director (at that time) of the state department of public works, and Edward Hyatt, Jr., chief of the state division of water rights. The plaintiffs are the Rindge Land & Navigation Company, Delta Farms Reclamation Districts Nos. 2,024-2,026, 2,028, 2,029, 2,042 and 2,044, and California Delta Farms, Inc. The suit embodies the request that the permit for the appropriation of 375 sec.ft. and 217,000 acre-ft. per annum of the waters of the Mokelumne River for power purposes recently granted the East Bay Municipal Utility District (Journal of Electricity, July 1, 1926, p. 29), be reviewed and denied.

The complaint states that the district filed with the division of water rights application for permit to appropriate unappropriated waters of the Mokelumne River, and protests that the district has not shown that there are any unappropriated waters in that river. Other grounds of protest cited are:

That the quantity of irrigable lands in the San Joaquin Valley is greatly in excess of any quantity of water which ever will be available for their irrigation; that the water of the Mokelumne River when totally conserved, distributed and applied to an economic and beneficial use in Calaveras, Amador, San Joaquin and Contra Costa Counties will not be sufficient for the future needs of those localities; that a large portion of the lands which are tributary to and which are irrigable and are near the Mokelumne River are subject to serious flood hazards from annual floods; that throughout the area mentioned thousands of acres of land are irrigated by pumping from underground reservoir and therefore the demands of reservoir have not been considered in determining the amount of unappropriated water in the Mokelumne River.

Three different times the complaint points out that the district can go for a water supply to other places where an over-supply of water now exists.

Applications for Water Rights in Ambitious Power and Irrigation Development Cancelled.—Seventeen applications of W. H. Sampson, Corning, Calif., for permission to divert several hundred second-feet of water from the Trinity River in Humboldt and Mendocino Counties, Calif., through a series of tunnels into Clear Creek, a tributary of the Sacramento River, have been cancelled by the Division of Water Rights. The project, which also contemplated irrigation of the western side of the Sacramento Valley from Red Bluff almost as far as Woodland and was estimated to cost $25,000,000, was described by state officials as "the most ambitious scheme of power and irrigation development to be presented in formal applications to the state water division." The cancellation resulted from Mr. Sampson's failure to appear at a hearing on the applications and to explain subsequently why he did not appear. At the same time that the division cancelled Mr. Sampson's applications it granted four permits to the Humboldt Placer Mining Company for 150 sec-ft. from tributaries of the Trinity River for mining. These applications were in direct conflict with those filed by Mr. Sampson.

Columbia River Commission Holds Organization Meeting

An organization meeting of the Columbia River Commission recently was held in Spokane. Dr. Elwood Mead, Commissioner of Reclamation, was elected chairman. Dr. Mead represents the Secretary of the Interior on the board.

An act of Congress passed at the recent session provides that the Secretary of the Interior may co-operate with the state of Washington, Idaho, Oregon and Montana in the allocation of the waters of the Columbia River.

One of the purposes of the study is to determine the amount of water supply necessary for the Columbia Basin Irrigation project. The board will undertake economic and other investigations, including the power possibilities of the stream. Another object is to report on the type of district organization best suited to handle the reclamation project.

Zinc Electrolytic Plant to Be Built.—Announcement of a $1,000,000 zinc electrolytic plant to be constructed at Kellogg, Idaho, by the Bunker Hill and Sullivan Mining Company during the next year, was made at Spokane recently. The first unit will have a day-and-night capacity of 50 tons of electrolytic zinc. A new process developed by the staff of the Bunker Hill and Sullivan Mining Company, which has a co-ownership with the Hecla Mining Company in the Sullivan company, will be used. This Tainton method will be given its first practical tryout in the new electrolytic plant. The Coeur d'Alene mining district as a lead producer has few equals in America, and the electrolytic process now to be used for zinc will put that metal on an equal basis in the district.

Town Votes to Sell Plant to Cement Company.—At a special election held in Gold Hill, Ore., recently the voters by a vote of 155 to 93 accepted the proposition of the Beaver-Portland Cement Company for the purchase of the municipal electric light plant according to press report, thus refusing the counter offer of the California-Oregon Power Company. The cement company offered $22,600 for the plant, with an option to purchase in five years. The power company offered $40,000 outright, with a promise to begin construction of a new plant within a year. The city plant was for sale and had been opened to competitive bidding.

Edison Company to Sell Additional Stock.—Southern California Edison Company has been authorized by the California Railroad Commission to issue and sell on or before June 30, 1927, 400,000 shares of its Series B 6 per cent preferred stock of the aggregate par value of $10,000,000, and to use the proceeds thereof to finance uncapitalized expenditures as of April 30, 1926, and to reimburse its treasury on account of retiring bonds in the amount of $974,165.97.

Refrigeration Industry Bans Unethical Advertising

For the purpose of attempting to remedy a situation which has developed as a result of the growing tendency on the part of manufacturers, distributors and dealers of both ice and electric regrigeration to use advertising and publicity attacking the other's methods a conference was called by the National Association of Ice Industries in Chicago recently. The meeting was attended by representatives of large ice companies and manufacturers of electric refrigerators, the American Association of Ice and Refrigeration, the National Association of Ice Industries, the Society for Electrical Development, and the Electric Refrigeration Council, the latter being an organization of electric refrigerator manufacturers now in process of formation.

At the meeting examples of negative advertising which have appeared recently in the form of newspaper advertisements, booklets and letters were reviewed and discussed. Advertisements emanating from both industries, making disparaging references, and in many cases, positive misstatements of fact, were pointed out. It was agreed generally among those present that all advertising of this class is not only ill-advised but also fruitless and unprofitable and a positive waste of money and effort.

It was pointed out that the common problem of both industries is to educate the public to a broader appreciation of the necessity for food protection through adequate refrigeration.

After a thorough discussion of the subject a resolution was adopted to the effect that the representatives of the associations and individual companies present went on record as being opposed to the practice of devoting space to unethical and unwarranted attacks by one industry upon the other; that they pledged themselves to use their influence to bring about the abatement of such advertising; that newspapers and magazines be requested to refuse it; and that advertising agencies and publicity writers be urged to use constructive methods only in presenting the subject to the public.

Brighton-Merced Line Placed in Operation July 6

The new Wilson substation of the Great Western Power Company of California and the Brighton-Merced 220-kv. line were placed in operation July 6. The completion of this line will enable the Great Western company to interchange energy directly with the San Joaquin Light & Power Corporation. All equipment has been provided for 220-kv. operation, but the line is operating at 165 kv. at present. (Journal of Electricity, July 1, 1925, p. 34, and Oct. 1, 1925, p. 261.)

The substation is located a mile and a half southeast of Merced, Calif. Outdoor equipment consists of a bank of 90,000-kva. transformers and necessary switch gear and equipment. A condenser of 25,000-kva. capacity is located indoors, together with control and metering equipment. Electrical equipment was rushed to completion in advance of the substation structure in order that the line might be placed in operation, so that the station itself is not quite finished. It is expected to be completed early in September.

Residence District Station Well Designed Architecturally

One of the latest automatic substations is the East Pine Street station of the Puget Sound Power & Light Company, Seattle, placed in service early this summer. Being in the heart of a better class residential district of the city, its architectural features were given considerable care in designing the building, with the result that the structure is a credit to its surroundings and has received much favorable comment from the residents of the neighborhood.

Planned for an ultimate capacity of 30,000 kva., the station now has installed two 3,000-kva., 3-phase, 13,200 to 4,000-volt transformers. It is fed by two primary feeders, and provision

Situated in one of Seattle's residential districts, special attention was given to the architectural features of this automatic substation.

is made for a total of four, while two 3-phase power circuits and thirteen single-phase residential feeders radiate from it. The single-phase secondaries are regulated, and one reserve regulator with transfer bus system is provided to transfer any feeder to the reserve regulator if necessary.

Automatic features of the station include elaborate arrangements for taking care of various emergencies and of the changing conditions of ordinary operation. One primary feeder acts as preferred and the other as auxiliary. In case of the failure of the preferred, the circuit breaker automatically opens and the auxiliary is cut in through the bus junction breaker. These lines are protected by reverse phase and low-voltage relay equipment. The transformer banks are protected differentially and thermally. One is held in reserve and is brought in automatically when the load on the main bank reaches 110 per cent capacity, cutting out again at 95 per cent. The reserve bank cuts in instantaneously in case of failure of the other bank through differential operation. The secondary feeders are equipped with reclosing equipment operating on a cycle of three reclosures before locking out in case the trouble continues to exist.

Call for Road Bids Forecasts Bridge River Plant Work

Commencement of the Bridge River development project is foreshadowed by the announcement that the British Columbia Electric Railway Company has asked for bids on the construction of a road from Bridge River station to the site of the portal of the proposed tunnel through Mission Mountain in connection with its proposed $30,000,000 hydroelectric installation at that point, the first unit of which is scheduled to be put into operation in 1930. (Journal of Electricity, Oct. 15, 1925, p. 305.) The distance from Bridge River station to the site for the portal of the big bore is 8½ miles. A subsidiary company, the Bridge River Power Company, has been formed to undertake the construction of the new plant.

The company also has let a contract for the completion of its Alouette-Stave Lake plant to the Northern Construction Company for a sum closely approximating half a million dollars. The work is to be commenced at once and to be completed by the end of this year.

Harvard Advertising Awards to Cover Industrial Products

An award of $2.000 will be given for the first time this year as a part of the Harvard advertising awards for the advertising campaign of the year coming under the consideration of the jury of award as the campaign most conspicuous for the excellence of its planning and execution that seeks publicity for industrial products primarily through the media of industrial, trade, or professional journals.

Industrial products seeking publicity through general popular magazines may compete for the award of $2,000 given for the best national campaign, either of an institutional character or devoted to the advertising of specific products.

The Harvard Advertising Awards were founded by Edward W. Bok in 1923 and are administered by the Harvard Business School. Awards are made annually, and advertising material to be considered for the current year must be received by the secretary of the Harvard Business School on or before Dec. 31, 1926.

Diesel Engines Prove Efficient.—Running continuously for 720 hours at rated speed of 95 r.p.m. under full load of 2,900 hp. and immediately swinging into a series of special tests is the record established by a 4-cylinder Shipping Board diesel engine built by the Worthington Pump & Machinery Corporation. The special tests included 6 hours at 10 per cent overload and 95 r.p.m., 4 hours at 10 per cent overload and 100 r.p.m., 6 hours at three-quarter load, 4 hours at one-half load, 2 hours at one-quarter load, 1 hour at full speed astern, and 1 hour of special maneuvering. The engine ran steadily through the trials with no adjustments and free from vibration or laboring. Fuel used amounted to only 0.462 lb. per brake hp. hr., and lubricating oil needed was only 15 gal. per day for all purposes. The average fuel tested 60 deg. Baume gravity, 177-deg. flash point and 270-deg. burning point.

Utah and Colorado Agree on Colorado Water Division.—In anticipation of a final authorization of Boulder dam, Representative Taylor of Colorado recently introduced a bill in Congress authorizing the states of Utah and Colorado to enter into a compact governing the use of waters in streams that flow from one state into the other. It was passed. A similar bill recently was passed in the Senate authorizing Idaho and Wyoming to form a compact governing interstate streams. Senator Kendrick has proposed similar bills under which Wyoming may enter into similar compacts with Colorado, Nebraska and Montana.

Civil Engineers Discuss Power Situation in Northwest

The various power plants of the Northwest and the general power situation of that region were the main subjects dealt with at the session of the power division of the American Society of Civil Engineers at its summer meeting in Seattle July 14-16.

Among the subjects discussed were: the present power situation in Washington, which was reviewed by Prof. C. W. Harris of the University of Washington who stressed the importance of the small hydro development; the Lake Cushman development, the details of whose design and construction were presented by J. L. Stannard, chief engineer of the project; and the Chelan hydro development, which was described by Victor H. Greisser, chief engineer, The Washington Water Power Company. An interesting feature of the session was the comparison made by W. D. Shannon, general superintendent, Puget Sound Power & Light Company, between the Lake Cushman and Baker River projects, which have many points of similarity. Further development of three power sites on the Skagit River by the city of Seattle was reviewed by Joseph Jacobs, consulting engineer of that city.

Of particular interest was a moving picture of the experimental arch dam built by Engineering Foundation on Stevenson Creek in California. H. W. Dennis, construction engineer, Southern California Edison Company, explained the pictures as they were shown.

Coffin Award for Contributor to Art of Lamp-Making

Marvin Pipkin, chemical engineer in the lamp development department of the National Lamp Works of the General Electric Company at Nela Park, Cleveland, has been awarded the Charles A. Coffin Foundation Award in recognition of meritorious service in the development of better illumination.

Mr. Pipkin's contribution to the art of lamp-making consists of perfecting a process for making strong, inside frosted lamp bulbs strong enough to supersede clear bulbs. Previous processes for frosting bulbs on the inside left them in a weakened condition and easily breakable. All Mazda lamps now are being made with an inside frosting which reduces glare and also gives more light than outside frosting. The new lamps have a pearl-gray appearance which takes on the color of any background, blending and harmonizing with fixtures, shades and surroundings.

Two Small California Utilities Apply for Permission to Sell.—Alturas Electric Power Company, operating in the city of Alturas and vicinity, Modoc County, Calif., and Mendocino Electric Light & Power Company, operating in the city of Mendocino and vicinity, Mendocino County, have filed a joint application with the California Railroad Commission for authority to sell, and Peoples California Hydro-Electric Corporation for authority to purchase and operate the properties of the former, and to issue $57,000 of its capital stock and $130,000 of first mortgage bonds in payment therefor.

Opposition to Proposed General Survey of Rivers

Washington Correspondence

Very general opposition is being evidenced toward the proposed general survey of rivers as proposed in the rivers and harbors bill. In compliance with a provision in the 1925 rivers and harbors bill, the chief of engineers furnished a long list of important rivers on which engineering data are incomplete. Major-General Harry Taylor, under whose direction the report was made, fears that the opening of general surveys on many rivers may result in demands that development be postponed until the survey is finished. The surveys necessarily would proceed slowly as the appropriations, in all probability, would be quite limited.

American Engineering Council is opposed to the surveys, and O. C. Merrill, executive secretary of the Federal Power Commission, thinks the whole water-power industry is against the provision as it appears in the pending bill.

Mr. Merrill long has been urging that Congress authorize the expenditure of license fees for river surveys as provided in the act. At present the license fees are being converted into the treasury as miscellaneous receipts. He thinks, however, that these studies should be confined to rivers about to be developed or on which some question has risen. The actual work would be done by the Corps of Engineers and the U. S. Geological Survey.

The river and harbor bill is on the Senate calendar but an effort will be made on the floor at the December session to amend the paragraph providing for the surveys.

Woman Wins Prize in Convention Light-Painting Contest

Mrs. Hearne Adams, wife of a salesman for the Electrical Household Utilities Corporation, Chicago, has been awarded $100 in gold, the prize for "painting" most effectively the "Lady of Light" at the National Electric Light Association convention recently held at Atlantic City.

Through the courtesy of Curtis Lighting, Inc., the "Lady of Light," a life-size wax figure, was presented within an iridescent shell on a beautifully draped studio stage. The guests were permitted to "paint" the setting with X-Ray color lighting equipment manipulated from a dimmer switchboard at the entrance to the studio. A score of switches, each having twenty intensities, controlled seven banks of concealed lights with more than seventy-five X-Ray reflectors and color screens. Over a million color combinations were possible, and each choice was recorded separately.

Three well known lighting men, S. G. Hibben, M. Luckiesh, and A. L. Powell, determined what in their opinion was the ideal combination of the color lights, and the prize was awarded to Mrs. Adams whose choice corresponded the most nearly with theirs.

Technical National Section Changes Name.—Engineering National Section is the title to be applied to the section of the National Electric Light Association formerly known as the Technical National Section. The change was adopted at the N.E.L.A. convention in Atlantic City.

California Delegation Prominent at Hoover Convention

Garbed in white coveralls and tall sombreros and traveling in a special car, the California delegates to the sixth international convention of The Hoover Company at North Canton, Ohio, attracted much attention. Further attention was centered upon them in the big parade held during the convention when they presented as their float a covered wagon drawn by two steers, with the caption, "As Forty-niners we're headliners." The California delegation also won second place in the window display competition through the display made by Carl Shepherd.

The convention was held in two sections, one for salesmen July 6-10, and one for managers July 12-17. The average attendance for the two weeks was 500, including 31 from California points the first week and 14 the second week, and 24 from England, Holland, Switzerland and Sweden. One hundred and eighty-five "maximen," the honor men of the Hoover sales force, were present, having met the requirements of selling 25 Hoover vacuum cleaners and 25 sets of dusting tools each month for eight months.

Among the delegates from California were George M. Plover, R. R. Fleming, Wm. Diamond, F. B. Skinner, S. M. Torrance, W. J. Kimes, L. R. Cahan, W. R. Chappalear, L. S. George, M. W. Johnson, D. M. Corcoran, F. J. O'Brien, I. E. Crow, C. B. Savage, C. F. Patty, W. A. Gray, Phil Claxon, B. L. Maranda, Carl Shepherd, D. P. Hoover, J. M. Lusher, Fred Meininger, R. L. Clark, P. C. Copeland, Lee Ragless, J. M. Taylor, J. Davidson, Ben Patterson and C. C. Collins.

This covered wagon with its '49ers, the float of the California delegation, attracted much attention in the parade at the sixth international convention held by The Hoover Company

Record Large Machine Ordered by Eastern Utility.—Having a continuous load rating of 160,000 kw. the new 60-cycle turbo-generating unit under order by the United Electric Light & Power Company of New York City opens a new chapter in the development of large machines. This equipment is to be supplied by the American Brown-Boveri Company and is to be installed in the Hell Gate station of the United company in New York.

Pacific Gas and Electric Company to Purchase 60-kv. Line.—Western States Gas & Electric Company has been authorized by the Railroad Commission to sell, and Pacific Gas and Electric Company to purchase for the sum of $85,000 a certain 60,000-volt electric transmission line running from the vicinity of Valley Springs to Altaville, Calaveras County.

Changes in Pacific Coast Staff Announced by McGraw-Hill

The following staff changes have been announced by the McGraw-Hill Publishing Company, Inc., for the Pacific Coast Division, effective July 1, 1926:

H. C. Worden has been appointed Pacific Coast sales manager for the Engineering and Mining Journal, Engineering News-Record, Chemical and Metallurgical Engineering, American Machinist, Power, Coal Age, and the Keystone Directories.

John W. Otterson, formerly business manager of the Journal of Electricity, has been appointed Pacific Coast sales manager for Electrical World, Electrical Merchandising, Radio Retailing, Journal of Electricity, Industrial Engineer, Electric Railway Journal, Bus Transportation, Radio Trade Catalog, Electrical Trade Catalog and Electrical Engineering Catalog. Mr. Worden and Mr. Otterson will assume joint responsibility for the sales for Ingenieria Internacional.

Roy N. Phelan has reliquished his duties on the editorial staff of the Journal of Electricity and been appointed assistant business manager of that publication. He also has been appointed secretary and treasurer of the McGraw-Hill Company of California.

W. A. Cyr succeeds to the duties on the editorial staff of the Journal of Electricity formerly filled by Mr. Phelan, and will give special attention to the development of the editorial work in connection with the contractor-dealer section of that paper.

Miss Ethel Jones has been promoted from the position of assistant news editor to news editor of the Journal of Electricity.

Seattle Plans to Expand Light Plant and Extend Railway

The Seattle municipal light department has introduced into the city council three ordinances calling for appropriations of nearly $1,500,000 to be used in enlarging the city light plant. Of this sum, $700,000 is set aside for extensions to serve new customers, and $495,000 for new street-lighting circuits, underground construction, relay system, commercial feeder at the Fremont substation, and the preparation of plans for a new substation to be built on Third Avenue between Spring and Madison Streets. The third ordinance appropriates $225,310 for enlarging and increasing the capacity of the West Seattle James Street, North Seattle, Seventh Avenue and Spokane Street substations.

Extension of the Skagit River railway from its present terminus at Gorge Creek to Diablo Canyon, at a cost of $350,000, is provided for in a bill also recently introduced into the city council. The present city railway extends from Rockport to Gorge Creek and cost in the neighborhood of $1,800,000. The proposed extension is a fraction more than four miles in length.

Irrigation District Applies for Power License.—The Murtaugh Irrigation District of Artesian City, Idaho, has applied to the Federal Power Commission for a license covering its project on Snake River and Rock Creek. The initial installation will be two units of 5,500 hp. each.

News Briefs

Increase Reuported for June in the Shipment of Industrial Trucks and Tractors.—June shipments of electric industrial trucks and tractors, as reported to the Department of Commerce by the nine leading manufacturers in the industry, were 144, as compared with 108 in May.

Colorado Utility Seeks Franchise Rights.—Extension of the franchise rights to supply Hillrose and Morgan districts with light, heat and power recently was sought by the Public Service Company of Colorado in an application presented to the Public Utilities Commission.

Franchise Granted Transmission Line in Pacific County, Wash.—The Willapa Electric Company, Raymond, Wash., has been granted a 50-year franchise by the commissioners of Pacific County to erect and maintain electric transmission lines over a new series of county roads in that county.

Yacolt, Wash., Buys Power System.—The city of Yacolt, Wash., has purchased the property of the Northern Clarke County Light & Power Company which formerly served the town. The equipment purchased consists of a power plant, poles, meters and a system valued at about $7,500.

Arizona Sodium Company Applies for Permit for Power Project.—The Arizona Sodium Production Company, of Phoenix, has applied for preliminary permit covering a proposed dam and reservoir on Aravaipa and Turkey Creeks, in Pinal and Graham Counties, Ariz. The power is intended for mining purposes.

Index to Volume 56, Journal of Electricity, Available.—An index to Volume 56 of the Journal of Electricity, covering numbers from Jan. 1 to June 15, 1926, inclusive, has been prepared and now is ready for distribution. Copies may be obtained upon request of the head office of the publication at 883 Mission Street, San Francisco.

Transmission System License Granted Idaho Power Company.—Land classification in Idaho and adjoining states finally has reached the point where the Federal Power Commission has the necessary data to embody in the license of the Idaho Power Company covering practically its entire transmission system. The license has been issued.

L. A. Railway Installs Instruction Equipment.—The entire equipment of the multiple-unit street car has been installed on the wall of an assembly room at the car shops of that company. A complete replica of a car-lighting system is installed on the ceiling of the same room. All piping and wiring is so arranged as to be easily traceable. All of the equipment is in operating condition and serves well in giving practical instruction in actual operation to the classes of men.

Eastern Oregon Company Files on Grand Ronde River.—Among recent filings in the office of Rhea Luper, state engineer, Salem, Ore., was that of the Eastern Oregon Light & Power Company, Baker, to appropriate water from the Grand Ronde River for the development of 1,364 theoretical horsepower, at an estimated cost of $810,000.

Pasadena Planning Installation of Ornamental Street Lighting.—Plans are being laid to install ornamental lighting systems on West Colorado Street, Pasadena, Calif., between the west end of the Colorado Street bridge and Avenue 64 and on Avenue 64 between West Colorado Street and Annandale Road. The improvement calls for the installation of underground conduits, curbs and gutters and sidewalks.

Fort Bragg Company Applies for Permission to Sell.—Fort Bragg Electric Company has filed with the California Railroad Commission an application for authority to sell its properties to Peoples California Hydro-electric Corporation. In the same application the Peoples company asked for authority to take over the Fort Bragg system and to issue $75,000 of capital stock, and first mortgage bonds of the face value of $150,000.

Ellensburg, Wash., to Purchase Energy from Puget Sound Company.—After a year's discussion the city council of Ellensburg, Wash., has decided to enter into a contract with the Puget Sound Power & Light Company to purchase electric energy from the power company to fill the needs of the city in excess of the capacity of the municipal plant. The alternative was to install Diesel engines to increase the plant's capacity.

Application for Toutle River Rights Rejected.—The application of Henry W. Coe for rights on the head waters of Toutle River in Washington, including storage in Spirit Lake, has been rejected, on the ground of lack of market and interference with the scenic and recreational value of Spirit Lake. In addition, the water rights are involved in litigation. (Journal of Electricity, Jan. 1, 1926, p. 29, and March 15, 1926, p. 236.)

Colorado River Compact Subject of Thesis.—Announcement has been made by Dr. Ruel L. Olson that his thesis, "The Colorado River Compact," submitted for the degree of doctor of philosophy at Harvard University, shortly will be off the press. Four years were put into study of the Colorado River development by Dr. Olson, and the thesis it is said covers all phases of the problem, beginning with a study of the administrative law features of the compact.

Duncan, Vancouver Island, B. C., Votes to Sell Lighting System.—By an overwhelming vote the ratepayers of Duncan, on Vancouver Island, B. C., authorized the sale of the local electric lighting and water systems to the Duncan Utilities, Limited, a subsidiary of the International Utilities Corporation, which recently acquired the Nanaimo electric lighting plant and is now negotiating for the Kamloops and Vernon plants. (Journal of Electricity, June 15, 1926, p. 591.)

Colorado Company Extends Lines.—The Home Gas & Electric Company, Greeley, Colo., at present is extending its power lines a total of 7 miles in order to reach several industrial concerns and a large number of pumping plants in shallow-water districts. One 3-mile extension is being made into the Olive Branch country. Another 4-mile extension from the end of the Gill line into Galeton will serve this district and supply service for the new power dump of the Great Western Sugar Company at that point.

Power Project Planned for Gross Creek in Clallam County, Wash.—A $500,000 hydroelectric power project is planned at Cross Creek, a tributary to Lake Crescent in Clallam County, Wash., according to Carl F. Uhden, formerly in charge of construction at the city of Seattle's Skagit plant. He has filed application for rights for a syndicate whose identity is not made public at this time. A 3,400-hp. plant is contemplated, the power to be used for industrial and mining purposes on the peninsula.

Great Northern Railway Awards Contract for Substation.—The Great Northern Railway has awarded contract to W. T. Butler, contractor, Seattle, for construction of a proposed substation at Skykomish, to cost $45,000. The station is the first of two to be built by the company in connection with its electrification program from Appleyard to Goldbar. The structure will be 65 x 74 ft. in size, one-story and of reinforced concrete. The General Electric Company has contract for furnishing the substation equipment.

City and Utility Not in Accord on Substation Price.—Lack of agreement between the city of Seattle and the Puget Sound Power & Light Company over the price of two substations the city is about to buy from the company is evidenced by a resolution recently introduced in the city council directing T. J. L. Kennedy, corporation counsel, to take legal steps to compel the company to accept a price of $119,000 for the two stations, one in West Seattle and the other on James Street. The price was fixed by a board of appraisers, but the company is asking $185,000.

Condemnation of Public Service Company's Loveland Plant Sustained by Supreme Court of Colorado.—The Supreme Court of Colorado has sustained the condemnation of the power plant of the Public Service Company of Colorado in Loveland. The company had appealed against the authority allowing the city to take over its property. The court held that the determination of the city authorities as to what property should be taken for operation of the plant was conclusive, unless fraudulent or unreasonable; that damages to the remainder of a state-wide system by what was done elsewhere than on the part taken could not be considered; that every presumption was in favor of the award and its invalidity could be established only by clear evidence. Both the initial construction of the Loveland municipal plant and the city's right to operate it after completion were opposed by the Public Service Company.

News of the Electragists

District Five First Red Seal Home Is Completed

District five's first electric home was completed recently by Charles N. Parmenter of the Franklin Electric Company, Roseville, Calif. It was the home of J. Rogers of that city.

The home of J. Rogers, of Roseville, Calif., the first Red Seal Home built in District 5. Charles N. Parmenter was the contractor.

Mr. Parmenter is a member of the Central Sierras Electric League and active in the affairs of that organization. Other Red Seal homes in that district are said to be in prospect, according to H. S. Furlong, chairman of that district.

E. L. McCleary, of the **McCleary-Harmon Company**, electrical contractors of Detroit, was a recent San Francisco visitor. Mr. McCleary is a past president and past member of the executive committee of the National Electrical Contractors and Dealers Association, the forerunner of the Association of Electragists, International.

Charles Lyman, Commercial Electric Company, San Francisco, was in attendance at the quarterly convention of the California Electragists, Southern Division, which was held at San Diego.

M. T. Dacus, Electragist of Ontario, Calif., and member of the firm of Granger-Dacus Electric Company. Besides being an Electragist, Mr. Dacus is also a Lion and recently helped the brethren roar in the convention of the Lions International in San Francisco.

Deney Liyda has opened a new electric shop in Edmonds, Wash. Mr. Liyda formerly was manager of the **Edmonds Electric Shop.**

L. McGinnis has been elected secretary of the Electrical Contractors and Dealers Association of Sacramento, Calif., succeeding **E. M. Miller.**

E. Bedford of the **Beverly Electric Store**, Beverly Hills, Calif., has sold his interest in the business to **J. L. Smith.**

E. Bedford has sold his interest in the **Beverly Electric Company**, 1435 Santa Monica Boulevard, Beverly Hills, to his partner, **J. G. Tozer**, who will continue the business.

Hall Electrical Company and Direct Line Telephone Company have removed their office and store from 37 California Street to 285 Eddy Street, San Francisco.

C. J. (Cy) Geisbush, executive secretary of the California Electragists, Southern Division, swings a mean bat! This snapshot was taken at the baseball game held during the recent meeting of the Electragists at San Diego.

The Apex Electric Shop of Salt Lake City recently moved to new quarters in its new building at 1029 East 21st South.

Robert R. Reid, contractor of Salt Lake City, formerly located in the McIntyre Building, has opened a new store under the name of the **Reid Electric Company**, at 35 Post Office Place. Mr. Reid intends to continue in the general electrical contracting business, featuring larger construction work.

The J. S. Walker Electric Supply, Inc., at 175 East Third South, Salt Lake City, Utah, has changed its name to **Progress Electric Supply Company.**

NePage McKenny Company, Seattle, has been awarded a contract for twenty-six ornamental street lighting standards for the Metropolitan Building Company in that city. This is the first part of an extensive lighting installation planned to light the area on which this company's buildings are located.

The Triple E Company, electrical equipment and engineering concern of Aberdeen, Wash., has been incorporated with capital stock of $30,000 by **P. A. Bertrand**, formerly manager of the Grays Harbor Railway & Light Company, **S. P. Phillips** and **Frank Thomas.** Mr. Phillips and Mr. Thomas have been operating **The Electric Store** at 206 East Wishkah Street. This store will be continued and will be equipped to include electrical engineering and to handle large installations.

Meetings

Naval Radio Station Inspected by Electric Club

An especially interesting session of the Electric Club of San Diego, Calif., occurred July 27 when Gilbert W. Cattell, chairman of the club's Army and Navy relations committee, conducted a tour through the Chollas Heights radio station of the U. S. Navy.

Mr. Cattell secured authority from Washington to allow the tour and to arrange for the complete isolation of the station for the period of time consumed by the club's inspection. Competent guides took the visitors in small groups to all departments of the station. The Chollas Heights radio station is known as one of the most complete and important national radio telegraph units. Naval officers attached to the station were guests of the club at luncheon, which was served in one of the buildings on the government reservation.

COMING EVENTS

Executive Committee, Northwest Electric Light and Power Association—
Meeting at Pacific Power & Light Company offices,
Portland, Aug. 9, 1926

Association of Electragists, International—
Annual Convention—Cedar Point-on-Lake-Erie, Sandusky, Ohio
Headquarters—The Breakers
Aug. 24-27, 1926

Electrical Supply Jobbers Association, Pacific Division—
Annual Convention
Empress Hotel, Victoria, B. C.
Sept. 7-9, 1926

American Institute Electrical Engineers—
Pacific Coast Convention, Salt Lake City, Utah
Sept. 7-10, 1926

Rocky Mountain Division, N.E.L.A.—
and
Colorado Public Service Association—
Joint Convention, Glenwood Springs, Colo.,
Sept. 13-16, 1926

California Electragists—
Annual State-wide Meeting—Hotel Del Monte
Del Monte, Calif.
Oct. 1-3, 1926

Electric Railway Men Guests of Rocky Mountain Committee

The electrical and utility men of Denver and members of the Rocky Mountain Committee on Public Utility Information acted as hosts during the recent third annual convention of the Midwest Electric Railway Association held in that city. Five hundred delegates were in attendance from the

states of Missouri, Kansas, Oklahoma, Arkansas, Nebraska and Colorado.

The principal speaker was Frank R. Coates, president of the American Electric Railway Association and vice-president of the Henry L. Doherty Company.

As part of the entertainment a trip over Lookout Mountain was arranged for the delegates. This included a visit to Buffalo Bill's grave and a banquet at the Motor Club of Colorado in Bear Creek Canyon.

Meeting of Executive Committee Is Called.—A meeting of the executive committee of the Northwest Electric Light and Power Association has been called by D. C. Green, president, for Aug. 9. It will be held at the offices of the Pacific Power & Light Company, Portland.

Book Reviews

POWER FACTOR WASTES

By Charles R. Underhill, consulting electrical engineer. 326 pages, 118 illustrations, 48 tables, 6 x 9 in., cloth bound. First edition, 1926. McGraw-Hill Book Company, Inc., New York. $3.50.

Power-factor wastes, so-called, are of vital interest and growing importance not only to electric utilities but also to power users.

This book accomplishes two important functions. First, it is directed at those directly responsible for a large proportion of the power-factor wastes. In this capacity it should serve well to acquaint those persons, as well as others interested, with the costs of power-factor losses and the various causes and cures that have been discovered and studied. Opinions of large operating organizations are included in the text and give it the note of authority. Second, this book serves as a nucleus on the subject, practically all previously published matter having been scattered in the form of articles or papers. It is a composite work of several well-versed persons.

The text deals with the subject in a logical manner, the approach to the general subject being through a discussion of the induction motor. This merges into an analysis of power bills and on into a discussion of the power-factor situation and the fundamental principles involved. Then follow methods and equipment incident to the correction of undesirable power-factor conditions, strategic system locations and other operating data. Statistical data and a general summary of the subject close the text.

REWINDING SMALL MOTORS

By D. H. Braymer, formerly editorial director, Industrial Engineer, Mem. A.I.E.E.; and A. C. Roe, industrial and insulation engineer, Renewal Parts Engineering Department, Westinghouse Electric & Manufacturing Company. 247 pages, 210 illustrations, 6 x 9 in., cloth bound. First edition, 1925. $2.50

This is a practical man's handbook on the subject of the winding of small d.c. and a.c. motors. While its construction and treatment of the subject is not that of a text book, it should be of use to trade and other non-technical schools. Technical discussions are avoided in the text except such little as is needed properly to amplify the procedure as presented.

The scope of the text is limited to small machines such as sewing-machine, grinder, fan, and other small motors of fractional horsepower. The authors treat their subject step by step, giving details as met with in the proper order from the start to the finish of the job. The prime object is to give the reader an understanding of the requirements of the windings that are in common use in such small motors at the present day. The book is prepared with the idea of enabling a greater despatch and efficiency in the repair shop handling rewinding jobs of this nature, inspired by the narrow economic margins within which such work must be done.

The book is divided into two parts, one dealing with d.c. motors and the other with a.c. motors. Each part is subdivided conveniently into chapters covering different phases of the rewinding procedure and descriptions of the various types of windings.

ELECTRIC CABLES

By William A. Del Mar, Chief Engineer, Habirshaw Electric Cable Company; past vice-president, A.I.E.E. A reduction of a series of lectures delivered to senior students in the Moore School of Electrical Engineering of the University of Pennsylvania, 1923-24. First edition. 200 pages, 58 illustrations, 19 reference tables, 9 appendices. McGraw-Hill Book Company, Inc., New York City. $2.50.

Mathematical arguments and the lengthy derivation of formulas have been avoided even though formulas are used quite extensively in the text. Subjects are dealt with in a simple, informal way that conveys the desired information quite satisfactorily.

A general statement of the cable user's problem and a brief historical sketch covering the development of electrical conductors and particularly cables is followed by information covering the different materials entering into the manufacture of various types of cables. The latest methods of installing and splicing underground cables are covered in detail. Cable-testing methods used in both factory and field testing are explained and the different faults classified. Fundamentals relative to the electrical characteristics of electric cables are touched upon briefly. The electrical characteristics themselves are dealt with more completely.

Important design features also are outlined. Aerial cables, submarine cables and single-conductor cables for triplex circuits each are touched upon and the more important points set forth.

Data pertaining to the present voltage limits in impregnated-paper cables, reasons for the limit and the present trend of manufacture are given. Wires and cables for miscellaneous special purposes are touched upon briefly, giving some of the special conditions which must be satisfied. A brief discussion of electrolysis and comment upon specifications and standards conclude the text matter of the book. The appendices cover various conversion tables and other specific data.

ALTERNATING CURRENT CIRCUITS

By J. M. Bryant, M.S., E.E., professor of electrical engineering, University of Texas; and J. A. Correll, M.S., associate professor of electrical engineering, University of Texas. First edition, 1925. 412 pages, 289 illustrations, 28 tables, 6 x 9 in., cloth bound, McGraw-Hill Book Company, Inc., New York. $3.50.

Designed as a text book for junior students in electrical engineering, this book contains the material in use for the past eleven years at the University of Texas. The text obviously is not intended to be a complete treatise on transmission lines, but rather as a general study of circuits of which the transmission line is an interesting practical example.

General theories of a.c. circuits are discussed in the first six chapters. Equations applying to the different types of circuits are developed from the fundamental physical and mathematical principles. A knowledge of mathematics through calculus and first-order linear equations is assumed, but the mathematical discussions are comparatively simple. Considerations are limited largely to non-magnetic circuits. Machines and such are withheld for a future text.

Applications of methods of solution to the various types of a.c. circuits constitute the major portion of the book. This is developed logically, beginning with simple theoretical circuits and progressing through long transmission lines. The final chapter is given over to a consideration of non-sinusoidal wave forms.

Vectors are used liberally throughout the text, and numerous examples are worked out to illustrate the application of the subject matter under discussion. The book should serve as a valuable text within its field.

G.R.H.

A.I.E.E. News

Saskatchewan Section held its regular summer meeting in an encampment near Estevan, Sask., where camping facilities were established for the purpose. The experiment was adjudged entirely successful and it is hoped to make it an annual affair.

Los Angeles Section.—Officers for the Aug. 1, 1926-Aug. 1, 1927, fiscal year will be as follows: chairman—R. E. Cunningham, Farnham & Cunningham; secretary—L. C. Williams, district manager, Pacific Electric Manufacturing Company; assistant secretary—H. L. Caldwell, Distribution Division, Los Angeles Bureau of Power and Light. The executive committee will consist of Julian Adams, electrical engineer, Pacific Electric Railway Company; P. S. Biegler, professor of electrical engineering, University of Southern California; J. C. Gaylord, planning engineer, Southern California Edison Company, and G. M. Wills, general superintendent, The Southern Sierras Power Company.

Personals

Paul M. Downing, vice-president in charge of electrical construction and operation, Pacific Gas and Electric Company, San Francisco, was elected second vice-president of the Pacific Coast Electrical Association at its re-

PAUL M. DOWNING

cent convention. Mr. Downing has had an interesting career in the electrical industry. After serving as dynamo tender with the Tacoma Light & Power Company, Tacoma, Wash., and as assistant motor inspector and powerhouse operator for the Market Street Railway Company in San Francisco, Mr. Downing in 1897 became station superintendent of the power house at Blue Lakes City, Calif., for the Blue Lakes Water Company. This was one of the first hydro plants in California and supplied power to the mines at Jackson and Sutter Creek, Amador County. In 1898 Mr. Downing became associated with John Martin as agent for the Stanley Electrical Manufacturing Company in the installation and operation of electrical apparatus in connection with long-distance, high-voltage transmission systems. In 1900 he was made chief electrician for the Standard Consolidated Mining Company at Bodie, Calif., and subsequently became manager of the Colusa Gas & Electric Company, Colusa, Calif., later absorbed by the Pacific Gas and Electric Company. The following year, after a short service as line foreman, he became division superintendent of the Bay Counties Power Company at San Francisco in charge of the transmission and distribution of power. The transmission voltage from the power house was 45,000, then the maximum voltage in the world. In 1903 Mr. Downing took the position of superintendent of substations for the California Gas & Electric Corporation and operating engineer for that company and for the Pacific Gas and Electric Company which later took it over. Subsequently he became division superintendent and operating engineer for the latter company, and in 1908 engineer of operating and maintenance. Nine years later he was appointed chief engineer of the electrical department. In January, 1920, he was made a vice-president of the company in charge of electrical operation, and shortly thereafter was given the title that he now holds.

Albert Meinema, for sixteen or seventeen years associated with the Electric Appliance Company, San Francisco, in various capacities, has severed his connection with that company. After an extensive Eastern trip Mr. Meinema plans to engage in business for himself.

C. F. Kettering, vice-president of the General Motors Corporation, his son and four associates, **C. S. Mott,** vice-president of that company; **W. A. Christ,** chief engineer of the Delco Light Company; **Julius Stone,** and **Adam Schantz,** touring the United States by special motor bus, arrived on the Coast recently. Mr. Kettering is in charge of the research department of the General Motors Corporation and is said to be the inventor of the electric starting and lighting system now in use on several makes of cars as well as of the Frigidaire cooling devices. The bus in which the party is traveling is equipped with electric lights and a Frigidaire, radio and other electrical conveniences.

R. E. Cunningham, of Farnham & Cunningham, Los Angeles, has been elected chairman of the Los Angeles Section, A.I.E.E., for the ensuing year.

R. R. Cowles, assistant engineer, department of electrical distribution, Pacific Gas and Electric Company, San Francisco, has been appointed member at large of the Engineering National Section, N.E.L.A. Mr. Cowles is retiring chairman of the Technical Section, P.C.E.A.

Al C. Joy, Sydney W. Green and **Miss Frances Pratt** of the publicity department, San Joaquin Light & Power Corporation, Fresno, Calif., visited San Francisco early in July to attend the convention of the Pacific Coast Advertising Clubs Association. Mr. Joy was one of the speakers at the public utilities departmental.

P. P. Pine, power sales engineer, San Diego Consolidated Gas & Electric Company, attended the July meeting of the water heating committee, Pacific Coast Electrical Association.

J. O. Dillingham, merchandising department, General Electric Company of Los Angeles, was in San Diego for a number of days recently.

Lieut.-Col. G. H. Whyte of the Calgary branch of the Dominion Water Power and Reclamation Service has been appointed assistant district chief engineer of the British Columbia and Yukon branch of the service, with headquarters in Vancouver, B. C.

Guy W. Talbot, president, Pacific Power & Light Company, and Northwestern Electric Company, Portland, has been named a member at large on the Public Relations National Section and a member of the water power development committee of the N.E.L.A. for the year 1926-7.

Paul Bailey, deputy state engineer of California since 1921, has been appointed state engineer succeeding W. F. McClure, deceased. By this appointment Mr. Bailey also becomes ex-officio chief of the division of engineering and irrigation and director of the department of public works.

P. H. Booth, of the Edison Electric Appliance Company, has returned from a business trip to Chicago. While in the East Mr. Booth attended a sales conference of that organization.

Gen. George H. Harries, vice-president, H. M. Byllesby & Company, recently arrived in San Diego from Chicago.

W. S. Van Winkle, president and general manager, Bay Point Light & Power Company, Bay Point, Calif., recently was elected president of the Contra Costa Electrical Development League.

P. H. Booth, of the Edison Electric Appliance Company, Los Angeles, made a special trip to Seattle to attend the recent wedding of **Ray W. Turnbull,** Pacific Coast manager of that company, and **Miss L. Carrol Dangler.**

J. B. Ledlie, superintendent, Mesilla Valley Electric Company, Las Cruces, N. M., has been re-elected secretary of the Rotary Club of that city.

John B. Miller, president, Southern California Edison Company, Los Angeles, has been named a member of the electrical resources of the nation committee, the constitution and by-laws committee, and the Electrical Manufacturers' Council of the N.E.L.A. for the year 1926-7.

A. W. Copley, manager engineering division, San Francisco district office of Westinghouse Electric & Manufacturing Company, has gone to the company's East Pittsburgh works where he expects to spend about two months studying the latest power equipment.

J. G. Rollow, electrical engineer for the Los Angeles Gas and Electric Corporation, has been made chairman of the Technical Section of the Pacific Coast Electrical Association for the coming year. Mr. Rollow was graduated from the University of Tennessee in 1905. Following his graduation he entered the employ of the Stirling Company, of Barberton, Ohio, which was purchased by Babcock & Wilcox Company in January, 1907. After spending one year with the International Steam Pump Company, he re-

J. G. ROLLOW

turned to the Babcock & Wilcox Company. In 1913 Mr. Rollow went to work for the Southern California Edison Company in Los Angeles, leaving that company in 1917 to enter the engineering department of the E. I. du Pont Nemours Company. From 1920 to 1924 he was consulting engineer for the Los Angeles Gas and Electric Corporation and in February of the latter year he was placed in charge of its electrical operation and construction with the title of electrical engineer. Mr. Rollow is a member of the A.S.M.E. and an associate member of the A.I.E.E.

Ross L. Mahon, who has been associated with the Pelton Water Wheel Company as sales engineer since July, 1913, has been appointed to the position of assistant sales manager. Mr. Mahon is a graduate of the University of California, class of '10, and later attended the University of Michigan for one year where he received the degree of B.S.E. in 1912. Upon completion of his studies he became associated with the Charles Butters Company, serving in an engineering capacity for one year. During the World War Mr.

ROSS L. MAHON

Mahon held the rank of captain in the 316th Engineer Regiment, 91st Division, participating in three major offensives in France and Belgium. He now holds the rank of reserve major in the same organization. Since being associated with the Pelton organization Mr. Mahon has taken an active part in the technical work of the Pacific Coast Electrical Association, of which he is a member. Likewise he has been active as a member of the American Society of Mechanical Engineers, Society of Military Engineers and the San Francisco Engineers Club.

Prudence Penny (Mrs. B. R. Charles), nationally known lecturer and journalist, whose articles on home economics appear extensively in the daily press, addressed the Electric Club of San Diego at a recent meeting on the subject "What I Know About Your Wives." Being one of the pioneers in the abolition of kitchen drudgery, she is of course an ardent advocate of the wider use of electrical service in the home.

Carl Sachs, of the Arrow Electric Company, Los Angeles, returned recently from a trip East where he attended a national sales meeting of the Arrow organization at Hartford, Conn.

J. U. Berry, advertising manager, Valley Electrical Supply Company, attended the convention of the Pacific Coast Advertising Clubs Association held in San Francisco in July.

Roy Worth, assistant district manager of the Pacific States Electric Company, San Francisco, has resigned his position with that company effective Aug. 1. He has been connected with the electrical supply jobbing business on the Pacific Coast for the past eighteen years. Most of that time was spent in the Northwest where he was district manager for the Pacific States company before his transfer to San Francisco three years ago. Mr. Worth is leaving San Francisco to look after personal business interests in the southern part of the state.

A. W. Leonard, president, Puget Sound Power & Light Company, Seattle; **D. L. Huntington,** president, The Washington Water Power Company, Spokane; **D. C. Green,** vice-president and general manager, Utah Power & Light Company, Salt Lake City; **John D. McKee,** president, The California Oregon Power Company, San Francisco, and **A. G. Wishon,** president, San Joaquin Light & Power Corporation, were among the Western men named as members of the Water Power Development Committee, N.E.L.A., for the year 1926-7. **W. E. Creed,** president, Pacific Gas and Electric Company, San Francisco, was appointed chairman of the committee.

William Dee has been appointed district superintendent of the Dominion Government telegraphs for the Ashcroft district of British Columbia, as successor to **C. E. Goodling,** and has taken up his duties with headquarters at Ashcroft.

W. A. J. Guscott, vice-chairman of the advisory board, Electrical League of Colorado, Denver, recently returned to that city after an interesting trip to Philadelphia.

H. B. Woodill, president, Safety Electric Products Company, Inc., Los Angeles, visited San Francisco a short while ago.

Ray W. Turnbull, Pacific Coast manager, Edison Electric Appliance Company, San Francisco, was given a luncheon by the electrical men of Portland on the occasion of his passing through that city with Mrs. Turnbull following his recent marriage in Seattle. About thirty representatives of the power companies, the jobbers, the manufacturers and the press were present.

W. C. Drummond, operating mechanical engineer, Byllesby Engineering and Management Corporation, visited the properties of the San Diego Consolidated Gas & Electric Company not long ago. Mr. Drummond expected to include in his itinerary all Byllesby properties on the Pacific Coast.

Fred Phillips, of the North Coast Electric Company's sales force, left Seattle a short while ago to attend the convention of the National Lamp Works of the General Electric Company at Nela Park, Cleveland.

R. H. Ballard, executive vice-president and general manager, Southern California Edison Company, Los Angeles, has been named as a member of the water power development committee, the electrical resources of the nation committee, and the Charles A. Coffin prize committee of the N.E.L.A. for the year 1926-7.

Maj. C. R. Olberg, assistant chief engineer, irrigation bureau, Indian Service, U. S. Department of the Interior, recently visited the Skagit River hydroelectric project under development by the city of Seattle, as a guest of the city council.

J. L. Stannard of Portland, Ore., has been retained by the city of Aberdeen as consulting engineer for both the power and water projects proposed on the Wynooche River. Mr. Stannard recently completed supervision of the Cushman Power development for the city of Tacoma.

R. W. Murphy, district manager, Westinghouse Lamp Company, San Francisco, returned not long ago from a business trip in the Pacific Northwest that lasted about a month.

Charles Heston Peirson, assistant vice-president, Southern California Edison Company, Los Angeles, attended the recent convention of the National Editorial Association in San Francisco.

David Hall, for seventeen years in the engineering department of the Westinghouse Electric & Manufacturing Company at East Pittsburgh, has been made manager of the newly formed engineering division of the company's Los Angeles district office. He has been engaged in the design and application of d.c. power machinery and equipment, steel mill equipment and similar equipment for the past twenty-five years.

H. L. Garbutt, manager merchandising division, Westinghouse Electric & Manufacturing Company, San Francisco, lately returned from a trip to the company's Mansfield and East Pittsburgh works.

Obituary

Charles A. Luckenbach, third vice-president and treasurer of the Los Angeles Gas and Electric Corporation, passed away July 9, at the age of 61, after a month's illness. Mr. Luckenbach was born in Bethlehem, Pa., March 24, 1865. He was graduated from Lehigh University in 1886, immediately entering the employ of the Crane Iron Company at Catasaqua, Pa. Three years later he went to Los Angeles. From 1890 to 1897 he was employed by the city of Los Angeles, first as deputy city clerk, later as city clerk. In August of the latter year he entered the employ of the Los Angeles Gas and Electric Corporation as purchasing

CHARLES A. LUCKENBACH

agent. In 1905 he was made manager of construction. He was elected third vice-president and a member of the board of directors in 1917, and the additional duties of treasurer were given to him in 1924. Mr. Luckenbach was very active in the affairs of the corporation, and his unexpected death came as a decided blow to the industry.

Harry H. Knox, president of the Alaska Electric Consolidated Company, Nome, Alaska, died in that city recently from an electric shock. Mr. Knox was an Alaskan pioneer and for many years followed electrical engineering in that country.

TRADE NOTES

Coffin Valve Company, Neponset, Mass., has issued an 83-page catalog on standard sluice gates, giving descriptive and dimensional information, recommendations and sample specifications. The book is lavishly illustrated.

Paul W. Koch & Company, Chicago, have placed on the market a new two-bladed saw, known as the "Jiffy" Joist Notcher. This is for cutting slots in wood joists for ½-in. and ¾-in. conduit. A depth gage prevents making excessive cuts, and as both cuts are made in one operation considerable time is saved.

The Cook Porcelain Insulator Corporation, Cambridge, Ohio, manufacturer of porcelain insulators and power-line hardware, has established a New York office at 161 Grand Street. **J. H. Parker** has been appointed eastern sales representative with headquarters in New York.

Westinghouse Electric & Manufacturing Company, East Pittsburgh, is manufacturing a new device known as the sentinel breaker, which will protect the motor and mechanism of washing machines, ironers and other electric appliances from damaging overloads. The breaker is reliable in operation and rugged in construction. In addition to protecting the motor, it also prevents blowing the house fuse.

Bakelite Corporation, New York City, has issued a large folder illustrating the uses of Bakelite. The opportunities it affords are presented more completely in another booklet, entitled "Bakelite Molded," a copy of which will be mailed upon request.

Taylor Brothers Churn & Manufacturing Company, St. Louis, has issued a folder containing complete information on its line of electric ice cream freezers. The folder is illustrated and contains a detailed price list. Descriptive and illustrative literature covering its line of electric churns is also availble.

Utica Products, Inc., Utica, N. Y., has announced that it has perfected its product, the Utica electric portable furnace, to a point where the company claims for it a more even temperature and greater heat than is possible with any other electric heater using a 660-watt element.

Chicago Fire Brick Company, Chicago, has issued bulletin 1, series C, describing and illustrating its products, including flat suspended arches, wall tie blocks, boiler door arches, brisket, thermopaste, electric furnace fire brick and Wellsville Savage fire brick. The advantages claimed for its products for electric furnaces are covered thoroughly.

Crouse-Hinds Company, Syracuse, N. Y., has issued bulletin No. 2089 on condulets for grounding, service wire and conduit system. Price lists and photographs are given.

General Electric Company, Schenectady, has issued a small pocket-size folder illustrating and describing its line of electric fans. Catalog numbers and price lists are shown.

The Burndy Engineering Company, New York City, manufacturers of high-tension bus equipment, has appointed the **H. M. Thomas Company,** San Francisco, as its California representative. Plans are being considered to warehouse the standard Burndy line of connectors for copper tubing and cable in San Francisco, thus establishing a quick shipping point for the West Coast.

The Chemical & Vacuum Machinery Company, Inc., Buffalo, N. Y., has acquired from the Judelson Evapo-Dryer Corporation, New York City, all rights to build and market exclusively the apparatus known as the Judelson Evapo-Dryer.

Atlantic Electric Goods Company, New York City, has issued a circular entitled "Erixolets," a name applied to fittings used in connection with a new system of electrical circuit distribution invented by F. W. Erickson. The folder is illustrated with photographs and contains complete descriptions as well as price list. The company is contemplating bringing out a new line of fuses, plugs and receptacles in the near future.

Out in the great open spaces of Concord, Calif., where gohphers are gophers, and no foolin', C. C. Caven, of the Graybar Electric Company (center), is going to try a little electrocution. Harry Barnard, Curtis Lighting Company, expert on X-Rays, thinks that Caven should try floodlighting, naturally, but Art Fryklund, also Graybar, pipe in mouth, reserves his opinion of trick electric gopher traps. Caven says, however, that the pears will be good next year if his patent electric traps do their stuff. Who said "rural electrocution" anyway?

The Timken Roller Bearing Company, Canton, Ohio, has changed its Los Angeles address to 1361 South Figueroa Street. It formerly was situated at 1241 South Hope Street.

The Foos Gas Engine Company, Springfield, Ohio, has issued a new circular on its type "L" diesel engine, a new unit, which it is claimed presents a decided advance in diesel engine design and construction.

Ludlum Steel Company, Watervliet, N. Y., producers of carbon and alloy tool steel, is changing over its mill from 40 to 60-cycle electrical equipment. This change is expected to bring about a greatly increased flexibility and output of the mill as a whole.

The Cutler-Hammer Manufacturing Company, Milwaukee, has issued a new publication entitled "Industry's Electrical Progress." The advantages of electric power to industry are pointed out and the progress made in electrical equipment, particularly in motors and motor-control apparatus, is described. Many photographs of installations are shown. Free copies of the book will be sent on request.

Roach-Appleton Manufacturing Company, Chicago, has started manufacturing lock-seam type 1-in. tin speaking tube, square elbows and tees for 1-in. speaking tubes.

The Anderson-Pitt Corporation, Kansas City, Mo., has developed a new instantaneous electric heater, which it is claimed embodies an entirely new principle in heater construction. The heater is a scientific reflector which controls all the heat rays. All the heating element faces the reflector at the correct position to get complete reflection of the heat rays. No current is wasted; all the electrical energy is converted into heat and evenly dispersed, according to the company.

Allen-Bradley Company, Milwaukee, has issued bulletin No. 600, which contains an interesting discussion on the merits of various types of starters for squirrel-cage motors with special emphasis on the characteristics of the compression-resistor type of primary resistance.

The Safety Electric Products Co., Inc., Los Angeles, has opened an office at 253 Golden Gate Avenue, San Francisco, with **G. G. Thompson,** vice-president, in charge. The concern recently issued a 1926 catalog which describes and lists all stock articles. In addition, it sets forth much engineering data which should assist electrical engineers in selecting the type of distribution switchboards and panelboards to suit the installation. Catalogs with price list may be obtained from either of the offices upon request.

The Edwin F. Guth Company, St. Louis, has developed a new fixture known as the Guthlite, which it is claimed controls and directs light, gives uniform intensity on the working plane, shadowless ceiling illumination and wide light distribution. It has an adjustable reflector and self-adjusting spring globe holder. **L. A. Hobbs** is the Western representative of the company with headquarters in San Francisco.

Ren Manufacturing Company, Winchester, Mass., has produced a simple and effective lock to prevent the theft of electric light bulbs. The Ren-Lock consists of only two parts, a coiled spring and a grooved ring. A special punch is used to attach the lock to the socket. It can be used with standard electric light bulbs and standard brass, porcelain and weather-proof sockets.

Landers, Frary & Clark, New Britain, Conn., has announced through its San Francisco sales office that its range division now has on the market an all-white porcelain line of ranges. The oven is also an entirely new feature as it now is lined with Resistain, a stainless and rostproof lining.

Roller-Smith Company, New York City, has added a supplement to bulletin No. 530 covering direct-acting time-limit attachments for standard-type circuit breakers. Illustrations and price lists are included in the circular.